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JOURNAL

VOLUME 8 NUMBER 1 • JANUARY, 1952

The SPE Prize Papers for 1951

A Proposal for Establishing Certified Injection Molding Machine Specifications — David J. Sloane

The Use of Air-Gap Insulation in Plastic Molds — William Kosobud

A Compound Curved Honeycomb Core Material For Sandwich Panel Construction — A. H. Herbst

and

The Story of The Hyatt Award

Successful Designing for Plastics Molding — W. M. Halliday

The Injection Molderscope — A. R. Morse

What's New?

People in the News

U. S. RUBBER PROMOTES

Three promotions have been announced in the footwear and general products division of U. S. Rubber Company. **C. William Pennington** is the new general merchandise sales manager, responsible for the sale of all products sold primarily through retail outlets. Mr. Pennington joined the company in 1926 at Portland, Oregon. He has been sales manager of wholesale products since July, 1950.

Charles F. Kadlec has been named sales manager of products sold through wholesale outlets. He was appointed branch footwear sales manager in October, 1949.

Augustus C. Ware succeeds Mr. Kadlec, with headquarters at Naugatuck, Connecticut, responsible for the sale of Keds, Kedettes and waterproof footwear throughout the country. He was appointed Atlanta branch district sales manager in 1945.

KLINE PROMOTED

Dr. Gordon M. Kline has been appointed Chief of the Organic and Fibrous Materials Division of the National Bureau of Standards. Formerly Assistant Chief of the Division and Chief of the Organic Plastics Section within the Division, Dr. Kline will remain chief of the plastics section for the present. He succeeds Dr. A. T. McPherson who has been appointed Associate Director of the Bureau of Standards.

Dr. Kline is internationally known for his researches in such fields as organic plastics, polymerization of olefins, dopes for aircraft, and adhesives. He has been technical editor of **Modern Plastics** and the editorial director of **Modern Plastics Encyclopedia** since 1936. He was one of the first American scientists to investigate the German plastics and chemical industries. These investigations were initiated well before the close of the war in Europe, and formed the basis for a series of papers on the advances of the German plastics industry during and since World War II. Recently he has supervised the work on the preservation of the originals of the Declaration of Independence and Constitution of the United States in special helium-filled glass enclosures.

He serves as Chairman of both the Federal Specifications Board Technical Committee on Plastics and the A.S.T.M. Committee D-20 on Plastics, and is also Secretary of the Plastics and High Polymer Division of the International Union of Pure and Applied Chemistry. In addition, he is a member of the Society of Plastics Engineers, the American Institute of Chemists, the American Chemical Society, the American Society of Mechanical Engineers, the Chemists Club of New York, the Society of the Plastics Industry, Sigma Xi, and the Washington Academy of Sciences.

GERMANY

The Economic and Scientific Unions and Organizations of the German Industry for Artificial Material announce that their annual meeting will be held October 11-19, 1952, in Dusseldorf, with the first large professional exhibition of the Industry for Artificial Materials.

PPP

"Plastics Personify Progress" is the winning entry in the slogan contest conducted by the Fifth National Plastics Exposition, sponsored by the Society of Plastics Industry, Inc., to take place next March 11-14 in Convention Hall, Philadelphia, Pa. George Whyte, sales manager of the Dominion Comb and Novelty Co., of Montreal, Quebec, was winner of the $500 first award. The contest produced 2367 entries.

EXPANDS

Cadillac Plastic Company, Detroit, has moved to larger quarters at 15111 Second Avenue, Highland Park, Michigan. The new building provides 15,000 square feet on one floor, and nearly doubles former facilities. The building will house all local activities of the company. Executive, sales and general offices, warehousing and supply, and manufacturing and fabricating will be centered there.

New Products

REINECKE

A new 16 mm magazine camera, designed by **Reinecke and Associates,** Chicago, is now being shown by Bell and Howell. The camera is the winner of the 1952 Society of Motion Picture Art Directors' Award. New features include an improved exposure guide, spring steel handle, and a die-cast aluminum body.

PLASTIC MOTOR

The first electric motor to use plastic as its sole structural material is being produced. It is designed around a frame and housing of Plaskon Alkyd, made by the Plaskon Division of Libbey-Owens Ford Glass Co., Toledo 6, Ohio. Metal is used in the motor only for electrical and magnetic circuits, in the shaft and for assembly screws.

DIE BLANK

The Accurate Steel Rule Die Mfgrs., 22 W. 21st St., New York 10, N. Y., announces that its dies have been successfully used on 12 types of plastics in blanking them out to any regular or irregular shape or size. A booklet, "How To Die Cut," is available from the company.

DECAL

Special decal nameplates, markings, and decorations for adherance to plastic, metal, baked enamel, raw wood and other "problem" surfaces have been developed by the American Decalomania Co., 4344 Fifth Ave., Chicago 24, Illinois.

VENEER

Formation of a new plastic veneer department in the Meyercord Co., 5323 West Lake St., Chicago 44, Illinois, has been announced. Mr. Zel Mann heads the department.

TANG TOOL

A complete new line of automatic tang break-off tools—for the removal of inserting tangs on helical-wire thread inserts—is now available from the Heli-Coil Corporation of Danbury, Conn. Operating on the principle of a spring-loaded center-punch, these tools remove tangs quickly without disturbing the inserts. Heli-Coil thread inserts provide durable female receiving threads in plastics, aluminum, copper, iron, steel, zinc, etc. They are used in the protection and repair of tapped threads in the fields of original equipment manufacture, production salvage, and maintenance.

AGILE

American Agile Corporation offers 1" and 2" Agilene Valves which are fabricated throughout from polyethylene, except for the packing rings, made from a polyethylene-polyisobutylene mixture. They are extremely light and are high resistant to most corrosive chemicals, including hydrofluoric, sulfuric, nitric and hydrochloric acids at temperatures up to 170°F. They are furnished with standard drilled flanges for easy incorporation into existing installations or for use in new pipe line assemblies. For more information, write American Agile Corporation, Plastics Division, Box 168, Bedford, Ohio.

NEW PLASTIC

A new plastic material, announced as about 1/6 the weight of stainless steel but with far greater corrosion resistance, is being produced by Bolta Products, Inc., of Lawrence, Mass. Called Boltaron 5200, it is a rigid non-plasticized polyvinyl chloride of high molecular weight, based on vinyl resins such as B. F. Goodrich Chemical Company's Geon-404. It may be welded, molded, extruded, fabricated, and machined after welding, and withstands wear well, resists practically all chemicals, has high tensile, and impact strengths, and is abrasion resistant.

NEW POLYESTER

Development of a new polyester laminating resin which will withstand temperatures as high as 500°F., has been announced by the Naugatuck Chemical division, U. S. Rubber Company. Marketed as Vibrin X-1047, the new material has the physical and handling properties of other types of older polyesters plus the advantage of high strength at high temperatures. It is being tested as a structural material in high-speed aircraft and guided missiles by the Wright Air Development Center at Wright Field, Ohio.

WET BLAST

A complete line of abrasives for wet blasting machines is available directly from stock of the Wheelabrator & Equipment Corp., Mishawaka, Indiana. Sizes range from 80 to 2500 mesh, packaged in 50-lb weights. The company can also provide from stock all other chemicals needed for wet blasting.

SYNTHANE

Synthane Corporation of Oaks, Pa., manufacturer and fabricator of laminated plastics for industry, announces the opening on January 1 of an Indianapolis sales office. The new office will provide improved service for industrial users of Synthane plastics in southern Indiana, southwest Ohio and Kentucky. Duane W. Roland, with the company's New York sales staff for the past three years, has been placed in charge of the new office. Mr. Roland is a graduate of the Wharton School of Finance and Commerce of the University of Pennsylvania.

NEW PROCESS

A new process for molding poly-styrene has been developed by the Plastics Division of Continental Can Company for use in the making of a plastic automobile thermometer to be clipped to the outside of an automobile ventilator wing. The thermometer clip was molded as part of the thermometer-housing and for extra strength was given a special heat treatment. A certain degree of intensive heat eliminated molding strain, giving a stronger, more flexible part.

Publications

PLIOVIC

A technical bulletin on compounding and processing properties of Pliovic, a vinyl resin, has been released by the Chemical Division of the Goodyear Tire & Rubber Company. The bulletin discusses the use of the Goodyear material in calendering, extruding and molding operations.

ED. AND PUB.

Editor and Publisher announces the 1952 edition of its Market Guide. According to E & P, market information may be easily and exactly assembled with the aid of new State Economic Area Maps, which divide each state into definite areas bounded by exact county lines. The guide also contains state Market Strength Indexes, surveys of 1497 key markets, a list of markets by size, and a lead article on Individual Incomes in 1950 by Charles F. Schwartz, U. S. Department of Commerce. $5.00 per copy.

Machinery

PLATENS

The Hydraulics Division of Wabash Metal Products Company, Wabash, Indiana has announced its new 50-ton series, models 50-15M —12" x 15" platens, and 50-24M—18" x 24" platens. The 50-ton series is a completely automatic, self-contained, precision manufactured unit group especially designed for pilot run and general production in molding and laminating operations in the plastic, rubber and wood industries. Special features include the rapid closing of the platens, a total available force of 100,000 pounds, automatic control of maximum pressure, distinct paralleling of the platens, and easy attachment of accessories.

HYDRAULIC PRESS

A new high-speed hydraulic press, Model 727, is now being made by F. J. Stokes Machine Company, 5500 Tabor Road, Philadelphia 20, Pa. The press may be used as a single installation or as an addition to an existing line. Available with either top or bottom plunger, it has an extra-long transfer stroke. Double pumps are used and the pressures and speed of each cylinder may be independently adjusted.

Yardley Promotes

Charles A. Ebner has been appointed Executive Vice President, and Walter E. Jacobson General Manager of the Yardley Plastics Company, Columbus, Ohio, Frederick B. Hill, President, announced.

Ebner formerly was General Manager, and Jacobson Assistant General Manager, of the plastics manufacturing firm.

As a co-founder of the Yardley Plastics Company ten years ago, Ebner is generally reputed to be one of the pioneers in the plastics processing industry. His engineering skill contributed to the development of many new household products, including plastic linoleum trims, polystyrene wall tile, plastic attachments for vacuum cleaners, etc. Since the company's inception Ebner has directed plant operations, with Hill as principal financial officer of the firm.

Jacobson formerly was General Manager of Yardley Industries. He was a member of the planning board which formed the new company in 1941. He became an officer of Yardley Plastics Company in 1945 and was named Assistant General Manager in 1950.

JOURNAL

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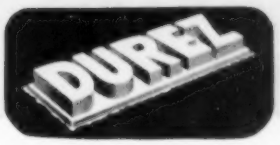
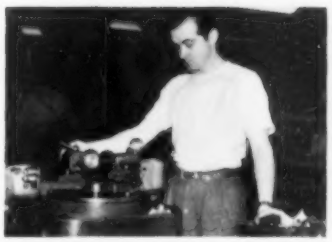
PROFIT HAS MANY FORMS

when the material is



BEVEL GEAR TEETH TEST ACCURATE



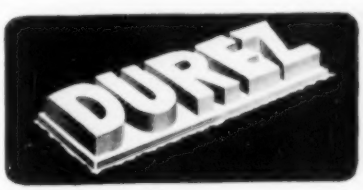
It takes a plastic of uniform molding qualities to make bevel gears that check okay on this angular tester. This is one reason why Durez high-impact phenolic is used for gears that drive reels through 8 treatments in modern continuous rayon spinning. Molded gears require but a single tapping operation, laminated ones used previously required hobbing plus a machined metal insert. Durez has a smooth natural finish. Its chemical inertness permits use in installations where corrosive agents are present.

FLEXIBLE CHAIN COVER

resists acids, alkalies, corrosion

Many services expose chain drive coupling covers to these hazards that shorten the life of metal covers. For such services, a leading concern meets its customers' needs with grit-proof and dust-proof split housings molded of rag-filled Durez phenolic plastic. The plastic covers provide sealed-in lubrication and maximum protection for the life of the coupling, when used with suitable lubricants. They are compact, strong, and easy to assemble, and they add to the good appearance of the equipment. Bosses and recesses, including tapered grooves for oil seals, are formed in the mold.

FOR MOLDERS DESIRING APPROVAL under MIL-P-14A, Durez is producing compounds having mechanical, electrical, and chemical characteristics in many popular combinations. Durez field technicians can help you, too, in applying molding compounds or resins to your processes. To keep informed on new uses of phenolics, write (on your letterhead, please) for our monthly Plastics News. Durez Plastics & Chemicals, Inc., 1101 Walck Road, N. Tonawanda, N. Y.



Phenolic Plastics that fit the job

with

METASAP STEARATES

PROBLEM: **How to obtain consistently perfect preforms and better finished products with maximum economy.**

ANSWER: **Plain as the hand of a "Plastiversal" machine in front of your face!**

In photograph A—the hand of the Plastiversal is registering 50 lbs. of pressure—the pressure required, at a leading molding plant, *before* Metasap Calcium Stearate was added to molding compounds. Such preforms were often badly delaminated upon ejection — as shown here.

In photograph B—the hand of the Plastiversal is registering 10 lbs.—all the pressure required to eject the same size preforms when they contained Metasap Calcium Stearate. Such preforms are obtained perfect in shape—as shown here.

Use of Metasap Stearates as lubricants in molding compounds results in:

Perfect Preforms—obtainable with lower ejection pressures.

Better Finished Products—because rapid, easy ejection results in clean-cut pieces with more marketable finish.

All of which means substantial production economies, longer mold life . . . increased output.

METASAP CHEMICAL Reg. U. S. Pat. Off.

METASAP CHEMICAL COMPANY, Harrison, N. J.

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Journal Policy
Statement of Aims

A special committee on Publications was formed in 1951 to help solve a number of problems connected with the publication of the SPE Journal. In the course of its work it was found that a clear statement of policy was desirable. This statement is found in the following paragraphs. The committee, headed by Ed Rowan, has as members Joseph Bonanno, Anthony Naturale, Carl Frosch, and Al Kaufman.

The policy of the SPE Journal is to disseminate information of both a technical and non-technical nature dealing with the various phases of plastics engineering. This knowledge is aimed at enhancing the status of the individual engineers and, through them, contributing to the progress and advancement of the plastics industry.

In the technical field, the SPE Journal will:

(1) Report on technical developments both here and abroad by means of formal articles, news items, abstracts of articles, reviews of new books and other publications, and similar material.

(2) Report on SPE activities in the technical field, including the work on standards and educational and training programs and relations with other engineering societies.

In the non-technical field, the SPE Journal will:

(1) Report on general SPE activities both on the national and local section level.

(2) Provide a sounding board for the individual expression of ideas of SPE members.

(3) Provide employment services to SPE members through advertisements and announcements.

(4) Promote a broadening understanding of the work of the Society and the contribution of the engineering members to the continuing growth of the plastics industry.

(5) Report general industry news that is of concern to the individual engineer.

Position Wanted

SPE members may place position wanted advertisements in the SPE Journal free of charge. So if you are looking for a new position in the plastics industry, don't overlook this service offered by the SPE.

SPE PRIZE PAPER CONTEST WON BY MACHINE SPECIFICATION IDEA

Mold Design and Light-Weight Panel Construction Papers Qualify for Second and Third Prizes.

SPE announces with pride the winners of the 1951 SPE Prize Paper Contest:

David J. Sloane

First Prize $200 — David J. Sloane, Lester Engineering, Cleveland, O. "A Proposal for Establishing Certified Injection Molding Machine Specifications."

Second Prize $100 — William Kosobud, Detroit Mold Engineering, Chicago, Illinois. "The Use of Air-Gap Insulation in Plastics Molds."

Third Prize $50 — Austin H. Herbst, Irvington Varnish and Insulator Co., El Monte, California. "A Compound Curved Honeycomb Core Material for Sandwich Panel Construction."

Prize money and a certificate were presented to each winner at the 8th SPE Technical Conference in Chicago, following the annual banquet. The winning papers, which were read at the Conference, are printed in full in this issue of the SPE Journal. Several other excellent papers which were entered in the contest are slated for publication later in the year.

A remarkable fact is that the first prize winner has come from Cleveland every year.

In 1947 Carl Snyder, "Coumarone Indene Resins; 1948 A. R. Morse "Empirical Factors in Injection Machine Design"; 1949 J. C. Stokes and A. R. Morse, "The Injection Molding of Derating Material"; 1950 George Blum, "Polyethylene—Properties and Uses" and 1951 David J. Sloane.

Judges in the 1951 SPE Prize Paper contest were: Carl Frosch, Bell Telephone Laboratories, Inc., chief judge; and Sven K. Moxness, Minneapolis-Honeywell Regulator Co.; George S. Nalle, Jr., Nalle Plastics, Inc.; Ralph K. Witt, John Hopkins University and Herbert S. Spencer, Durez Plastics and Chemicals, Inc.

The Sixth SPE Annual Prize Paper Contest is now open.

An entry may deal with any aspect of the plastics industry, and should embody new ideas or be original in presenting known facts in a new light. There are no restrictions as to length, or SPE membership.

Three typewritten, double-spaced copies should be submitted to the local SPE section of which you are a member, or to the geographically nearest section if you are a non-member.

All drawings and graphs should be in India ink on white paper.

Last entry date will be on or before October 15, 1952.

For further information write to Dr. Jesse H. Day, 409 Security Bank Bldg., Athens, Ohio.

SPE LAPEL PIN DESIGN CONTEST HONORS GO TO E. H. ROBERTS

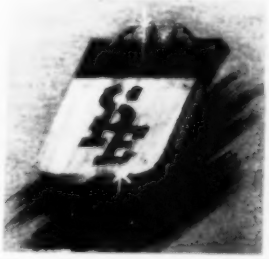
The SPE Lapel Pin Design Contest was sponsored in an effort to find a design that SPE members could wear with pride on their lapels, and which would identify the wearer as a member of the Society of Plastics Engineers.

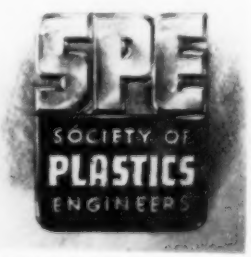
The best of the designs submitted was one sent in by Edward H. Roberts, General Electric Company, Erie, Pennsylvania. The prize money of $50.00 was presented at the Eighth Annual SPE Technical Conference in Chicago.

The designer suggested that the pin be made of a "'see-deep' plastic with a bright gold or silver SPE raised from the back and with a silver or gold color metal bezel around the plastic. The name 'Society of Plastics Engineers' is stamped around the face of this bezel." The design was made with a reddish brown center background for white initials and a gold bezel with reddish brown lettering.

Mr. M. A. Nichols, President of Manco Products, Inc. has offered to make and donate Tru-cast Beryllium Copper Cavities in which to mold the pin.

First Prize Winning Design by Edward H. Roberts

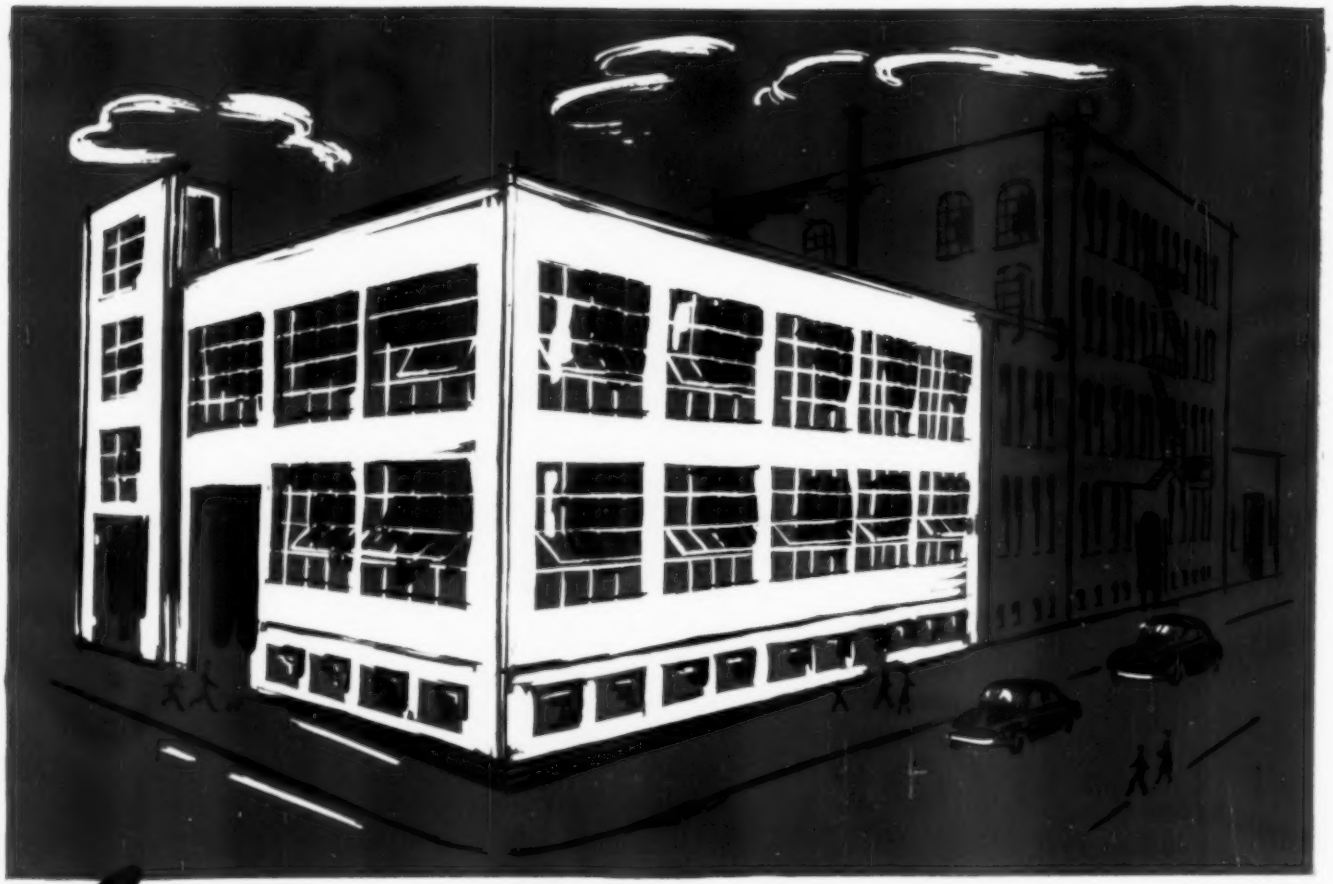




Designs which came in second and third were both submitted by Charles L. Smith, Ohio University. E. C. Tickner's design (right) drew favorable comment.

Certificates of merit have been presented to: Charles L. Smith of Ohio University whose designs placed second and third; E. C. Tickner, Millburn, N. J., whose design placed fourth; and to Walter Kosy of Chrysler Corporation, Detroit, whose design placed fifth.

Judges for the contest were: J. H. DuBois, Plax Corp., Chief Judge; L. H. Barnett, Loma Plastics, Inc.; J. McLeod Little, J. M. Little and Assoc.; Philip A. Belk, Hercules Powder Co. and Bess R. Day, SPE.



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TURN OUT BIGGER MOLDS ...AND DO IT FASTER

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The new machine tool facilities of Newark Die Company are housed in a modern building that is designed throughout for the efficient handling of molds in *really* big sizes. Floors are constructed to withstand heavy loads. Overhead cranes and other up-to-the-minute materials handling equipment keep big molds moving smoothly through the plant.

This plant expansion has greatly increased our ability to provide prompter, more economical service on molds, hobs and hobbed cavities — *with even greater accuracies than ever before.*

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Phone: MArket 2-3305

NDCo TRADE MARK

FIRST PRIZE — 1951 SPE Prize Paper Contest

A Proposal for Establishing Certified Injection Molding Machine Specifications

By DAVID J. SLOANE
Lester Engineering, Inc.
Cleveland, Ohio

INTRODUCTION

An injection molding machine is two things, a system for clamping molds and a system for melting thermoplastics and forcing them into the molds.

An injection molding machine should have two basic specifications which accurately describe these features, but throughout the molding industry there is no general agreement as to the meaning of the specifications with the result that they are generally misunderstood and frequently misapplied. Their relationship to one another is a subtlety appreciated only by a minority of molders and their importance while emphasized in academic discussions is ignored on the practical operating level.

It is my purpose in writing this paper to draw attention to the need for precise methods of arriving at both of these specifications, methods which can be applied by all members of the industry, widely understood, and agreed upon generally as a basis for using and comparing injection molding machinery.

To that end I intend to describe two relatively simple tests which can be applied to commercial injection molding equipment to bring all types to a common standard of comparison, so that molders in using their equipment will do so with confidence that their experience with one type of equipment can be related to other types of equipment with a higher degree of accuracy than is possible today. In our present state of development this condition does not exist. And worse than being an inconvenience, this complete lack of uniformity in method of rating clamping and melting capacity has been a serious handicap to thermoplastic technology in the sense that technicians in the industry have made many judgments and come to many prejudices on the basis of erroneous ratings of clamping capacity versus indeterminate ratings in plasticizing capacity.

Finally it is my purpose to suggest a method by which the industry, aroused to interest in the problem, can insure that these tests or others perhaps more precise, will be accepted as the basis for **certified** standards.

TEMPERATURE INDICATING TEST NOZZLE

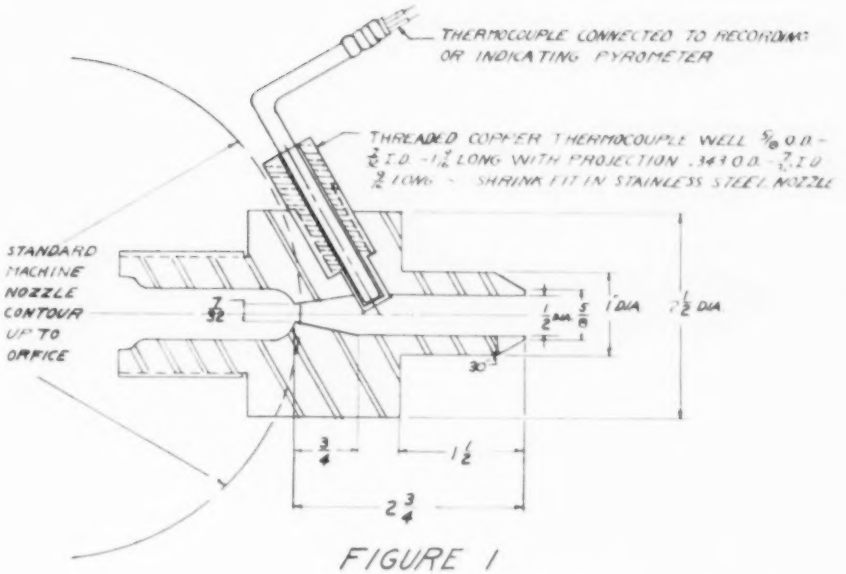

THERMOCOUPLE CONNECTED TO RECORDING OR INDICATING PYROMETER
THREADED COPPER THERMOCOUPLE WELL 5/8 O.D. - 3/4 I.D. - 1 1/2 LONG WITH PROJECTION .344 O.D. - 7/16 I.D. 1/2 LONG - SHRINK FIT IN STAINLESS STEEL NOZZLE
STANDARD MACHINE NOZZLE CONTOUR UP TO ORIFICE
7/32
1/2 DIA
5/8
1" DIA
2 1/2 DIA
30°
3/4
1 1/2
2 3/4

FIGURE 1

Beginning first with plasticizing capacity, consider the problem of a project engineer assigned to purchase a machine to produce a disc 13 inches in diameter, 134 square inches in projected area, .100 thick, 13.4 cubic inches of molded material, from 26 cubic inches of granular material, 8.2 ounces of polystyrene or 10 ounces of acetate.

Generally the man would be inclined to consider a 12 ounce machine for the job. (Unless he happens to be susceptible to advertising, in which case he might choose a 4 or 8 ounce machine). To begin with "12 ounce machine" is a misnomer in itself because it's never been settled of which material it is 12 ounces. In passing it would seem far more useful to indicate "cubic inches of effective injection plunger displacement" so that a molder could ignore varying bulk factors and specific gravities of different thermoplastic formulations and always know that so many cubic inches of the granule to be molded can be fed and displaced by the machine under consideration.

The project engineer examines a 12 ounce specification sheet and concludes that his discs per hour depend almost entirely on one specification which is listed "Plasticizing rate, pounds per hour:"

Machine A	80 lbs. (Acetate)
Machine B	*
Machine C	70 lbs.
Machine D	90 lbs.
Machine E	130 lbs.

and in small print "dependent on mold construction and molding material" which says in effect, "please ignore the foregoing."

If the man is inexperienced and this has happened many times, he can reasonably assume that his production rate is figured by dividing the plasticizing rate by the weight of his piece, $\frac{1}{2}$ pound in this case. His figures would be tabulated as follows:

	Lbs. Per Hr. Part Wt.	Shots Per Hour	Seconds, Overall Cycle
Machine A.	80 ÷ $\frac{1}{2}$	160	22$\frac{1}{2}$
Machine B.	*		
Machine C.	70 ÷ $\frac{1}{2}$	140	26
Machine D.	90 ÷ $\frac{1}{2}$	180	20
Machine E.	130 ÷ $\frac{1}{2}$	260	14

Experienced molders know that competitive plasticizing rates cannot be compared because they are not calculated or estimated by uniform standards. And in fact experienced molders know that the present so-called specification is absolutely without value in practice. Machinery manufacturers are in a dilemma too. If they show the plasticizing rate as a conservative figure (as it would please them very much to do) they put themselves at a serious sales disadvantage because many jobs can be run faster than they claim. If they rate their machines on the high side, then they are inviting their customers into bitterly expensive errors in estimating, because many jobs cannot approach the fastest molding rates. The conclusion is that in its present form "Plasticizing rate" is trying to be a one word description of a machine characteristic which requires a volume to describe completely. For this reason one manufacturer has replaced the number with an asterisk.

PLASTICIZING RATE

Plasticizing rate is intended as a measure of how fast the melting system can soften thermoplastic to a flowable condition. Thermoplastics vary, one from the other, very greatly in all the characteristics that determine this melting rate, so that plasticizing rate must immediately be related to one type of material, selected as standard. Thermoplastics have varying degrees of flowability, so that depending on the particular mold in question the one material formulation selected as standard would be flowable at temperatures within a range of approximately 150 degrees F. A thin section with long flow would require the hot extreme of flowability while a heavy section short flow would require the low extreme. Naturally the plasticizing rate would vary all over the lot. Just as it would as a result of differences in molding standards. Where fine quality is demanded, as against casual quality standards, the plasticizing rate in terms of hourly production would be lowered.

The contradiction in "plasticizing rate" is the fact that machinery builders have tried to estimate an average "production rate" for jobs which they have never seen. This is no specification. In the past it has been more like the tabulation of a ouija board.

Instead I would propose the acceptance of a standard temperature indicating or recording nozzle as shown in Figure 1 which would be applied in turn to each of the commercial machines offered for sale.

The one material formulation and color, presumably a polystyrene, which was sold in the greatest quantity in 1951 would arbitrarily be selected as the basis of comparison.

PROPOSED METHOD

The method proposed is to set all pyrometers at their optimum setting, (600 degrees F. is one recommendation), and purge the machine into the air through the test nozzle. When the material passing the nozzle shows a uniform reading of 400 degrees F. and the machine cycle has been reduced to a minimum, the output of the machine for half an hour can be collected and weighed and the result tabulated as the melting rate of the machine being tested. My own experience with this test as well as the experience of others has shown that where the cycle is set too fast the temperature of the material leaving the nozzle will drop below the required value. A further requirement would be that the machine be set to feed its rated capacity, whatever it might be in the material specified.

The test nozzle illustrated in Figure 1 was designed to give a standard orifice size of 7/32 inch at the end of the conventional nozzle for a particular machine. The part beyond this orifice toward the outlet end of the nozzle was designed to permit the material to continue in a uniform stream at low pressure past the copper thermocouple well into a relatively long flow channel from which it can easily be collected into a container. The problem of erosion and leaking at the point of thermocouple entrance is very slight because the pressure of the material is released once it has passed the orifice and the nozzle is used only for testing rather than for production purposes. If the thermocouple is connected to a recording pyrometer then it would be possible for the machine test to be recorded and filed with the agency which finally sponsors the test.

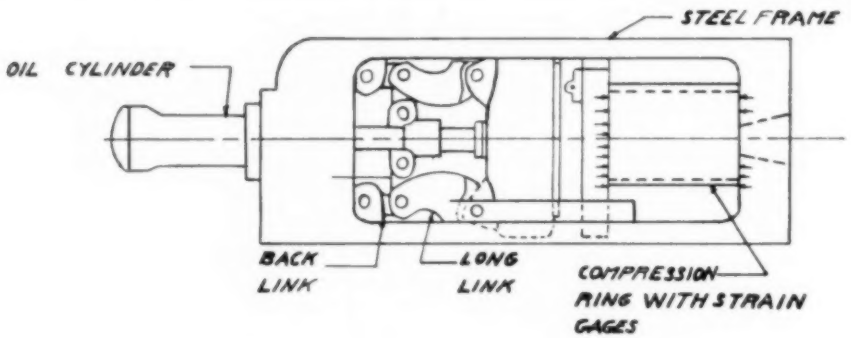
SPONSOR GROUP

The tests might bear the name of the group which sponsors it, whether it be the Society of Plastics Engineers, The Society of the Plastics Industry, the American Society for Testing Materials, or the Joint Industry Conference. With this sponsorship it would only be a matter of time before the capacities of commercial machines were common knowledge. Each machine would be recognized to be capable of melting a definite poundage of the selected material per hour to 400 degrees F. Other materials would be delivered in proportionately greater or lesser amounts depending on their thermal conductivity, heat stability, specific heat, and flow characteristics compared to the standard material. The method of introducing these tests to the industry will be discussed at the end of this paper. For the present let it suffice that this is a simple and inexpensive start toward bringing this one specification into a condition that plastics engineers can use and compare with confidence that they are talking the same language.

The other specification, clamping tonnage, is in an equally nebulous condition. Its importance is at least equal to the first. Clamping capacity is a machine factor which, if misapplied, can result in critical financial losses both from overweight in the moldings and machine maintenance.

CLAMPING TYPES

First it is worth noting that the two basic clamping designs have certain important differences. A hydraulic clamp will build up a certain locking tonnage which it can sustain without backing up. When that tonnage is reached in the mold, the machine blows open and keeps moving back until it has relieved the mold pressure by flashing and the plunger has bottomed. In contrast the toggle type lock builds up a certain locking pressure which it can sustain without backing up. When that amount of force is applied in the cavity, the mold begins to back up, but as it



TEST RING IN TOGGLE CLAMPING ASSEMBLY OF INJECTION MOLDING MACHINE

FIGURE 2

does, the toggles are put under greater compression than the original lock created and the bars or frame are put under greater tension, so that the mold parting is resisted with a proportionately greater force as the mold backs up. The point of the difference is that a hydraulic clamp has a precise point at which it is completely overloaded and therefore a precise clamping tonnage whereas a toggle clamp has a range of overload in which many jobs can still be held and molded.

It is worth noting at this point the factors which make up the force that blows open the clamping system. If molten thermoplastic were a liquid, an injection molding machine would be a mold holder in combination with a pouring spout, a molding process very much to be desired and perhaps someday even to be realized. The mold would fill by gravity and the expensive and complicated clamping ends would be obsolete. For the present, however, this is only a fantasy and the fact is that in molten condition, thermoplastics are a rapidly chilling taffy, rather than an easy flowing liquid. Therefore the molds will not fill completely except when the thermoplastic is forced in at high pressure.

EFFECTIVE PRESSURE

Conventional molding machines at present have settled at an injection pressure of approximately 20,000 pounds per square inch at the plunger tip as an appropriate injection pressure for the general run of molding jobs. Applying Pascal's law, that gives a pressure in the mold, at the instant that the injection plunger comes to a stop in the forward position, of 10 tons to the square inch. If this pressure were applied on a fluid, it would be transferred undiminished to every crevice of the mold. As it happens, it is applied on a rapidly cooling thermoplastic which varies in consistency, depending on the material and the heat, from a fluid to a taffy. Tests conducted in the Dow Chemical Company lab and described in articles in the April 1950 and April 1951 issues of MODERN PLASTICS magazine indicated that a material section of .170 inch gave an effective pressure in the mold equal to 30% to 65% of the plunger tip pressure of 10 tons to the square inch depending on the stock temperature. On thinner sections it is reasonable to assume that this percentage (if not reduced is effective for a shorter interval and therefore can be considered to be) and is as little, but no less than 30% of the plunger tip pressure.

With these figures in mind it is apparent that the 134 square inch disc which our imaginary project engineer has to mold will exert a separating force in the mold of 134 square inches times 10 tons to the square inch times approximately 30%. The clamping force required is therefore 390 tons when the stock temperature is held at a moderate level. On those occasions when the pyrometer permits an over-ride or the operator allows a delay between cycles the clamping force necessary might rise from 390 tons to 650 tons. Referring to the clamping specifications of the leading manufacturers of 12 ounce equipment:

	Rated Casting Area In Mold, Square Inches	Clamping Tonnage
Machine A.	110	275
Machine B.	110	350
Machine C.		275
Machine D.	110	300
Machine E.		400

These tonnage ratings, though arrived at now by individual and unrelated methods, could be a specification, but the casting area recommendation falls into the realm of the swami as the plasticizing rate does. It represents an imaginary job and a suggestion which is more harm than good to the engineer trying to apply it. My own opinion is that if the industry accepted a uniform method of calculating and testing clamping pressure, there would be no reason to show recommended projected areas.

Fig. 3 Test Ring with Strain Gauges installed.

The following is a method of checking machine clamping which was developed in cooperation with Prof. D. K. Wright of Case Institute of Technology and which again is simple and direct. The method involved is to take strain gauge readings from a compression ring placed in the center line of a machine and loaded to the utmost capacity of the clamping end of the machine. In the case of the hydraulic end this is the point of maximum pressure setting. In the case of the toggle machine this is the stalling point. The ring is sized to fit as many of the standard machines as possible and where necessary spacer plates can be used to accommodate it. (Three rings for three clamping ranges would suffice for all equipment). The ring is sized to give a deflection of an order which can be read by strain gauge equipment at the most sensitive part of its scale. The ring would be taken to an engineering college where eight SR4 type C1 Baldwin strain gauges would be mounted on the inside of the ring at 90 degree intervals, four mounted parallel to the axis of the ring, four along a circumference. The four axial gauges are connected in series as are the circumferential gauges, forming respectively the active and compensating legs of an ordinary Wheatstone Bridge circuit. All readings and calibrations are made with a Baldwin SR4 strain indicator.

With the strain gauges in place the ring is placed in a universal testing machine (Baldwin-Southwark or similar) and calibrated for various compression loads in the range of the machines to be checked. With this information tabulated, it is a simple matter to install the test ring in the machine to be checked and interpret the compressive deflection of the ring as read through the strain gauges, relating it directly to the known readings of the testing machine for the same deflection.

This method of testing has already been used by the writer on both toggle and straight hydraulic locking ends with success. Figure 2 illustrates the testing ring installed in a machine. Figure 3 (photograph) shows the strain gauges in place in a test ring.

So much for the two tests which in my judgment are adequate for an excellent beginning. Unfortunately there has never been a group in the industry whose vital interest or enlightened self-interest demanded these types of **certified** ratings, as they are demanded in some other industries. This industry has never been "scientific" at the production level to the point where operators and molders recognize the need or lack of these **certified** specifications. There has been much travail and hardship as a result of the discrepancies noted, with attendant losses of great amounts of money, but no group of sufficient unity and strength ever campaigned for these standards. Unless part of industry demands them as a prerequisite to purchasing machines, the machinery manufacturers have no important motive for working the ratings out among themselves.

J.I.C. STANDARDS

There is in the industry one group whose association for another purpose has brought some very excellent changes in the hydraulic circuits and electrical circuits of plastic and die casting equipment. The JIC standards in the automotive industry are now universally recognized and observed by all manufacturers who solicit machinery sales from this group. If this same group, or even the General Motors' plastic technical group insisted on these **certified** ratings as

(Continued on Page 10)

The Injection MOLDERSCOPE

By A. R. MORSE

President, Injection Molder's Supply Co.

Injection Molderscope First Anniversary

Just a year ago this column first reared its timid head. The idea of a few paragraphs devoted to a specific phase of the plastic industry—and dealing as frankly as possible with practical matters faced by the injection molder—was somewhat at variance with the policy of the average trade papers who scoff at specialization and try to cover the plastic industry with a broad brush. If it isn't a generalization you can't say it is the watchword of the typical industry paper. Don't offend our advertisers! You can't print that! We know it is true, but we don't dare say it! Such cautions mute most technical articles, take the stimulating properties out of them and reduce them to the level of carefully edited advertising material.

You have to dig for information on injection molding as a rule. All news of our industry is buried in a veritable avalanche of data on sheeting, low pressure molding, chemicals and other aspects of the expanding business known as plastics. And it is pretty well diluted of any real news when you do find it.

Comments Vary

The comments received on the column have been varied. Several molders said you will just get yourself into trouble if you want to try and tell the truth—but the molders are for us. Some rightly warned me of indignant thunder in the conservative ranks of the machinery people. One mammoth material company actually threatened to sue me and run me out of business if I so much as mentioned their name without getting all kinds of clearances and permissions to do so!

It is always very interesting to compare what injection molders report about their machines with what the injection machinery men themselves think. A great discrepancy exists. The president of one of the newer injection concerns told me that they had **no trouble at all** with their machines and that they did not see why an emphasis on service was necessary. Often if what the molder thinks about a machine is reported to its builder he will refuse to believe it or take it as a personal insult, or call you a distorter of facts. It is important to understand why the machinery people have this viewpoint. The investment in fixtures, in tooling, in inventory, in engineering and design are costly enough committments to give almost anyone a blind spot when it comes to making a change which affects all these things right down the line. The volume of injection machines made is relatively small so the costs are not spread over a big production, and changes represent a serious problem.

But by and large the concept of an outspoken column devoted exclusively to the injection molder and his problems (a field incidentally, to which the writer is devoting his life's work) was well received and supported. And I confess to being opionated, to being wrong, but at least a hearing has been given to a good many suggestions that would not have otherwise survived the red pencil of the editor of the typical trade paper.

Another Freeze on Injection Machines

The injection machine is the orphan of the equipment field. It is built as a fill-in product by at least six if not more manufacturers. When they don't have a need for the capacity to produce presses, lathes, pulp mills, furnaces, and so on, they push through a few lots of injection machines. This type of equipment has risen to be a full product in its own right in relatively few plants. When any kind of trouble or uncertainty threatens, what happens? The injection machine is ruled non-essential (both officially and non-officially) and is quietly dropped out of the schedule. It's happened again, so the injection machine molder should be used to it by now.

After the last freeze from 1941 to 1945 one of the greatest feats of business management ever recorded was performed by the elder F. W. McIntyre then Vice-President and General Manager of Reed-Prentice Corp. With a foresight which was truly remarkable, he planned for the end of the freeze. In one year he produced you might almost say more injection machines than his company had produced in all the preceding years from 1937-1945. And what is perhaps more important, he arranged to get out of production just as the demand was satisfied. The production surge in injection equipment in 1946 led to the formation of at least 200 new businesses—at least I stopped counting at that figure. After this new freeze will it be Reed-Prentice or another concern who will correctly perceive the size and type of machines that will be needed and who will be able to produce them in volume?

There have been few if any changes in the average injection machine since 1946 except in size distribution and the hullabaloo about preplastifying. The new heat sensitive materials are crying for improved heaters. The price of machines indicates some radical changes are going to be necessary. Injection machinery is now lagging behind the materials available, and little if any research is being done on the new heat sensitive materials which when properly handled lend themselves to new concepts of heater design and clamping mechanism. '52 looks gloomy, for with few machines in prospect (due both to the freeze on heavy equipment and to shortages of steel and other components) there will be little incentive for research. But it does present an opportunity to someone to look into his crystal ball and foresee volume production on some one machine.

During 1952 we are going to cover items like the ball check nozzle, weighed feed, thermocouple location on which we are doing some work right now, and anything else of current interest. Suggestions for topics to be covered will be welcome.

Injection Machine

(Continued from Page 9)

part of their guarantee in purchasing injection molding machinery, the machinery builders would be obliged to carry out either these suggestions or others which may be better.

As a group the manufacturers of machinery are reputable and once the standards were accepted in the industry there would be no reason to police the tests. Each manufacturer in cooperation with some engineering college could work out their own nozzle and rings according to the test requirements and publish their own data. The tests are simple and inexpensive enough to be carried out in the field by any interested customers and the likelihood that this would happen would be all the restraint necessary to insure the correctness of the published data.

The Society of the Plastics Industry or the Society of Plastics Engineers could encourage this trend with publicity but they could not drive the point home alone because they don't have the bludgeon of huge sales with which to make their request heard as the two groups listed above do have. Initially, these ratings would be confidential for the use of the sponsoring purchasing group until all spec sheets could be revised to conform but eventually we could anticipate that all spec sheets would be published with these two specifications, melting capacity and clamping capacity **certified** according to JIC or GM standards. To the very great benefit of thermoplastic technology and plastic engineering.

SECOND PRIZE—1951 SPE Prize Paper Contest

THE USE OF AIR-GAP INSULATION IN PLASTIC MOLDS

By WILLIAM KOSOBUD

Detroit Mold Engineering Co.
Chicago, Illinois

The efficient use of insulation within a plastic mold has been long neglected due to the lack of a suitable heat or cold transfer barrier medium. Transite has been used a great many times but its use has been limited due to its compressibility and subsequent damage to vital mold parts after the mold has been subject to pressure. As a result, the importance of certain temperature control areas within a mold have been neglected and temperature control has been more or less dependent on one range for the mold as a whole.

This paper proposes the use of air-gaps or dead air spaces within a mold so as to insulate certain portions away from other temperature zones within a mold.

One important use of air-gap insulation has been in the sprue bushing. The hot plastic material passing through the sprue bushing that is installed in the water cooled cavity plate permits a material chill to take place even before the plastic reaches the cavity proper. This chilling effect can be held to a minimum by the use of a series of concentric radial undercuts, or a large undercut relief area, to provide an air space between the sprue bushing and the cavity plate; such as illustrated in Figure A. This is especially important where the sprue bushing is necessarily long and also in the case of restricted gate (pin-point) molds where the fluid state of the plastic material is doubly important.

CONTACT SURFACES

Another important insulation control zone is in the contact surfaces between the mold plates and the press platens, especially in the case of thermosetting plastic (compression) molding. This insulating can be accomplished by a series of longitudinal grooves, or cross-hatch grids, cut right into the mold contact surface so as to provide a certain amount of air-gap insulation between the hot mold plates and the press platens.

One of the most important uses of air-gap insulation is in the hot-runner mold. This high speed mold design requires critical temperature zone-control and this can only be accomplished by the use of air-gaps or dead air spaces. To best illustrate this point, we describe herewith a typical hot-runner mold design as illustrated in Figure B.

One of the most efficient, though often most misunderstood mold designs is the hot-runner mold. Material and labor shortages have brought added interest to this very efficient design which is now made practical through the use of air-gap insulation.

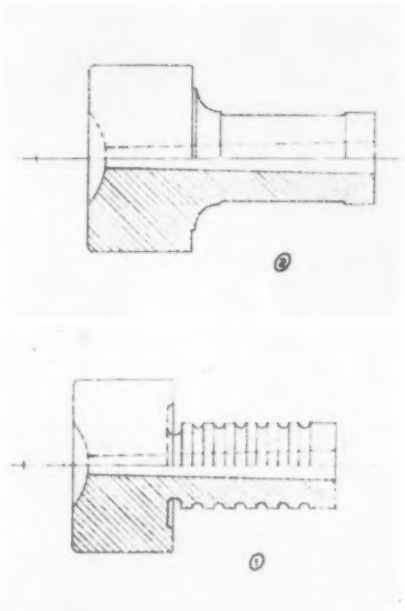


Fig. A Sprue Bushings before and after being cut for air-gap insulation.

Too often in the past, the conventional three-plate mold or floating-plate mold as it is sometimes called, has been the basis of the design of the hot-runner mold. Actually the designs of these two molds are separate and apart from each other. The three-plate or floating-plate mold depends on cycle removal of the gate system, whereas the hot-runner mold actually contains the runner system in a fluid state as a part of the injection machine nozzle.

Considerable difficulty has been encountered in the past with hot-runner molds employing a split runner plate construction. Leakage was so great as to force the plates apart and the use of transite insulation within the mold was adding additional mechanical difficulties when the transite started to compress under molding pressures.

The design shown in Figure B, of a typical hot-runner mold, is a modification of the original design shown in the August 1946 issue of DME News (Detroit Mold Engineering Co. publication). You will note that the two plate runner system is dispensed with as is the use of transite insulation within the mold. Transite can be used as an insulation between the top clamping plate and the machine platen as illustrated in Detail A, however this is optional and even though the transite compresses, little harm can result at this point. If insulation is required at this surface, the use of a series of cross-hatch grid undercuts could be used to good advantage. Detail B shows the top clamping in which the solid hot-runner plate (Detail C) is inserted. It is best to utilize a high grade of toughened steel for the hot-runner plate, such as DME #2 steel at 300 Brinell or better. This hot-runner insert plate is just large enough to accommodate the ends of the cavities and is to project from the top clamping plate about $\frac{1}{4}$" or $\frac{3}{8}$" to provide air-gap space around the hot-runner plate, and to utilize this air-gap as an insulation between the top clamping plate and the cavity plate. In order to provide adequate support points between the top clamping plate and the cavity plate, a series of small rest buttons are inserted in the air-gap area around the hot-runner plate insert. (Detail F).

HOT-RUNNER PLATE

The hot-runner plate is self heated with adequate thermostatically controlled electric cartridge heaters to provide sufficient heat to maintain the plastic material in a fluid state while within the hot-runner plate. In order to secure additional insulation of the hot-runner plate from the top clamping plate, and the contact area adjacent to the cavity plate, a series of $\frac{1}{8}$" wide x $\frac{1}{8}$" deep with a $\frac{1}{8}$" land spacing undercuts are machined into all six surfaces of the hot-runner plate, even to the extent of a series

of radial grooves machined into the top contact area of the individual cavity inserts. In the case of hot-runner molds it is important to contain the relatively high temperatures of the hot-runner system away from the cool areas of the cavity plate. The use of air-gaps provides a non-compressible insulation barrier that accomplishes this. The runner system of the hot-runner plate is a series of reamed holes properly located with suitable plugs (Detail E) at the ends to block off the runner away from the secondary sprue. This runner system is generally larger in diameter than the usual ¼" standard adopted in most restricted gate molds (diameters from 5/16" to ⅜" are customary). In the case of the cavity insert, most of the time the secondary sprue can be made as a part of the cavity, thus eliminating the need for a separate sprue bushing at this point. The taper on the secondary sprue is the reverse of that used in the three-plate mold. In the case of hot-runner molds, the secondary sprue taper is towards the cavity and the piece part is drawn from the mold with the small sprue attached, thus eliminating the danger of a "cold-slug" at this point. Adequate cooling in the cavity and core plates (Detail H) should be provided as the temperature factor is very important in order to obtain the high speed production this design is capable of.

Each individual mold has its own characteristics and this paper cited only a few uses of air-gap insulation to help make the mold designer aware of this important medium of zone temperature control within a mold.

ST. LOUIS ELECTS KOLLER PRESIDENT

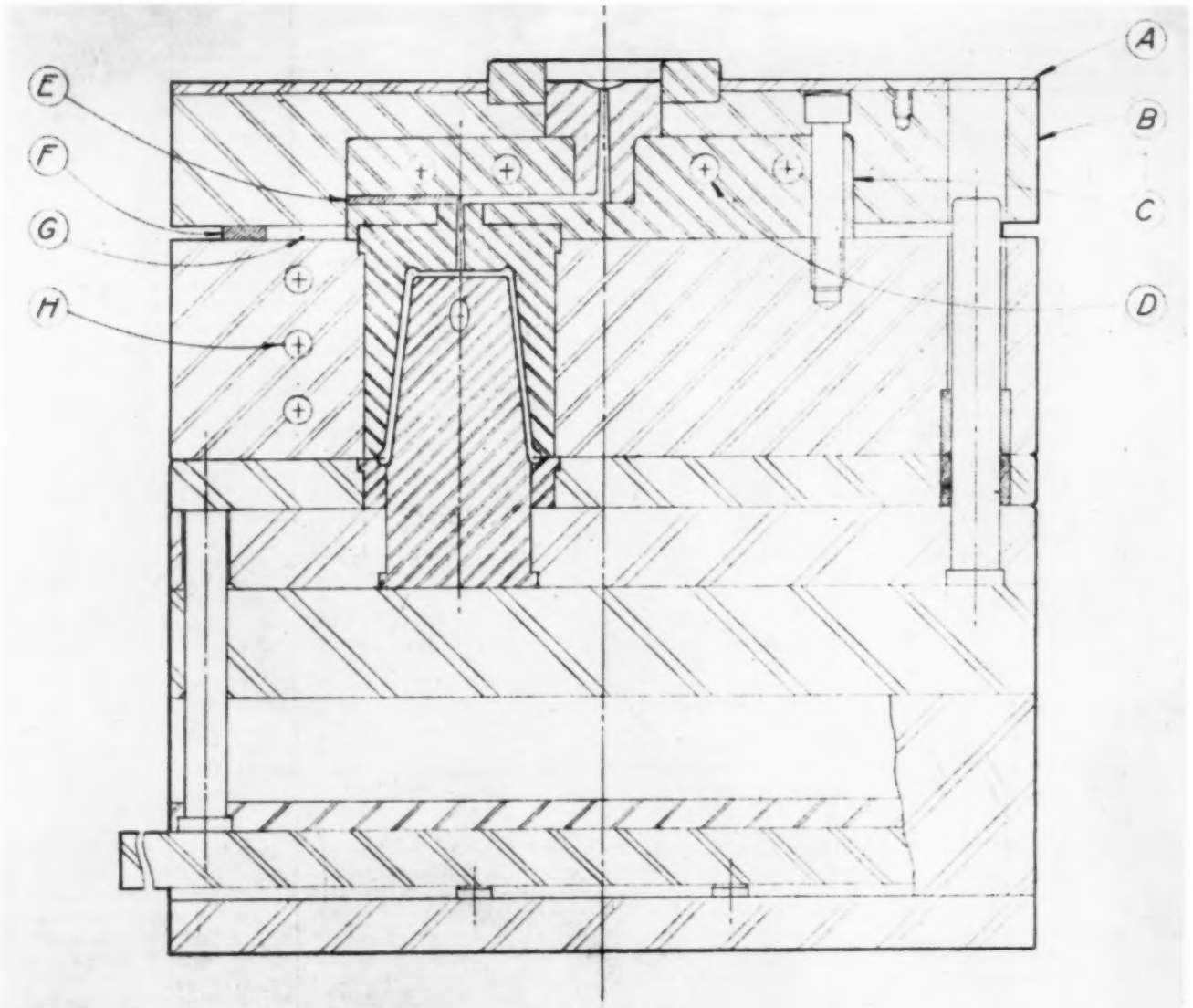
By DAN OTTO

The St. Louis Chapter of the Society of Plastics Engineers had their Xmas party, Tuesday, December 18th at the Melbourne Hotel. We dispensed with the regular formalities of the meeting and had no speaker, but we did have a Christmas Party.

We had a rather large turn-out, despite the bad weather.

New officers were elected and Mr. Al Koller of Koller-Craft Plastics is our new president for 1952.

There was quite a bit of discussion about the representation at the Edgewater Beach Hotel, January 16th and it looks like there will be quite a few going up from St. Louis.



HOT RUNNER MOLD FIGURE "B"

THIRD PRIZE—1951 SPE Prize Paper Contest

A Compound Curved Honeycomb Core Material for Sandwich Panel Construction

By AUSTIN H. HERBST

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Considerable data and technical information have been published (1-31) in recent years describing the use of plastics in the field of sandwich panel construction. In sandwich panel construction, thin, high strength facing materials or "skins" are intimately bonded to both sides of a rigid, low density correspondingly thicker core. The resulting sandwich panel is characterized by excellent strength—weight and stiffness—weight ratios. The core materials used in the past have included balsa wood; foamed in place resins; molded or expanded cell configurations (hexagonal, etc.) fabricated from paper, aluminum foil, glass or cotton fabrics, etc.; sponged hard rubber; polystyrene and cellulose acetate foams.

With the exception of the foamed in place types, all of the low density core materials previously mentioned are limited in the same manner in that they are produced only in flat slabs, sheets or blocks.

In order to fabricate these materials into curved assemblies such as radomes; micro-wave reflectors; bulkheads; pontoons and floats; tapered chord sections such as are found in wings, fairings, aerodynamic control surfaces; etc., it is necessary to cut, kerf, fit and glue together small pieces of the flat core to approximate the desired contour. This is an expensive operation and wasteful both of materials and labor and further limited by the following shortcomings.

SHORTCOMINGS

(1) Not adaptable when thick contoured core sections are required due to the inability to obtain the necessary flexibility to form thick core sections.

(2) Not adaptable when compound curvatures exist; i.e. in more than one plane, unless the core sections are machined on a planograph.

(3) Extreme care must be exercised in the bonding of the facing skins to the pre-arranged assembly of core sections in order to prevent shifting of the core, especially when the facing skins consist of a wet lay up of several plys of resin impregnated fabric.

(4) Not adaptable when the core configuration varies widely in cross section.

In theory, the above shortcomings are largely overcome through the use of the foamed in place resinous core materials, however, these too are quite limited in that they:

(1) Have relatively poor physical strength properties. Fatigue resistance under repeated stress is also poor.

(2) Are difficult to obtain in uniform densities especially where sections vary in cross section.

(3) Are difficult to manufacture from a production standpoint in that they require critical timing and heating cycles and in some cases, high pressures or toxic chemicals.

KONTOUR-KORE

The principal object of this paper is to introduce the "Kontour-Kore" process for the production and fabrication into compound curved shapes of a low density core material which does not have the limitations of the core materials previously described.

More specifically and in its broadest aspect, the present invention (patent applied for) concerns the fabrication of a honeycomb type core structure by the assembling in juxtaposition individual hollow tubular units, or cells, either against a flat die surface or upon a contoured die surface and then bonding the assembly together to form a high strength, low density configuration.

The individual, hollow, tubular elements may be of any cross sectional area and shape. Typical cross sections are represented by a circle, a polygon, or an ellipse and the diameters of the elements may range from 1 16" to 1" or larger as desired. The elements may be of any desired length, depending on convenience. The preferred shape, from the standpoint of maximum strength for a minimum of weight, is the hollow cylindrical tube (32-34) which incidentally is also the simplest to produce.

The manner in which the tubular elements are formed or produced is immaterial insofar as this disclosure is concerned and it should be understood that use may be made of tubular elements of any cross sectional configuration regardless of the manner of producing same (extrusion, high speed spiral wrapping equipment, drawing, etc.)

The individual hollow tubular elements may be either metallic or nonmetallic or a combination of the two (for example, one ply aluminum foil and another ply paper, etc), depending on the physical or chemical properties desired in the ultimate core configuration.

The individual, hollow tubular elements may be impregnated with either an organic or inorganic binder to improve the physical and chemical properties of the base material of which the tube is formed and to serve, when desired, as an adhesive for bonding the individual hollow elements together into a strong core unit or configuration.

The binder may be either thermoplastic or thermosetting in nature and may be cured or hardened in a conventional manner, such as by condensation, polymerization, etc. The cured binder may be either flexible, semi-flexible or rigid in nature. The ultimate physical and chemical properties of the core unit or configuration depend, in part, on the ratio of the binder to the material comprising the tubular elements. This ratio may be varied by such obvious methods as varying the viscosity of the impregnates; by varying the length of time in the impregnating bath; by removing the excess binder by centrifuging, and so on.

PROCEDURE

In some instances, impregnation of the filler or tubular elements may not be necessary as in the case of the employment of thermoplastic tubular elements which may be combined into a strong core body of desired configuration, merely by heat and pressure.

To illustrate more specifically the manner of carrying out the present invention for the production of a core unit having the ends of the tubular elements so arranged to provide a contoured face, reference is made to Figure 1 wherein the letter (a) generally designates a mold for an object containing both simple and compound curved areas on **one** of its surfaces. (This case of curved area existing

on more than one of its surfaces will be discussed later). The mold comprises a bottom unit (a) enclosed within removable side walls (c) so as to produce a structure having an open top. Within the mold the top surface of the bottom unit (b) presents a contoured form as indicated at (b).

The mold may be made of any suitable material, particularly a non-porous material but, if made of wood, concrete or the like, may be given a sealing surface coating of lacquer. In addition, the mold surface should be coated with a suitable parting agent such as silicone grease, soap, lecthin, polyvinyl alcohol lacquer, etc. For convenience, the mold should also be constructed with removable sides.

MOLD FILLING

The mold is tilted on one of its sides to facilitate filling with bundles of hollow, tubular elements, previously cut to the same predetermined length (for this illustration although not necessary) and with square cut ends. The precut elements may be conveniently handled in bundles of several hundred units, for example double handfuls, by restraining the bundles with rubber bands. For this illustration the hollow, tubular elements were right circular cylinders constructed of two ply 40# sulfate paper spirally wrapped continuously at the rate of 150 feet per minute. The cell diameter was 0.250" with an approximate wall thickness of 0.006". Density of the unimpregnated tubes was six pounds per cubic foot.

The plurality of tubular elements are arranged uprightly in laterally abutting series so that their major axes are perpendicular to the plane of the mold surface. As the rubber bands are removed from around the bundles, the tubes are pressed or

Figure 1

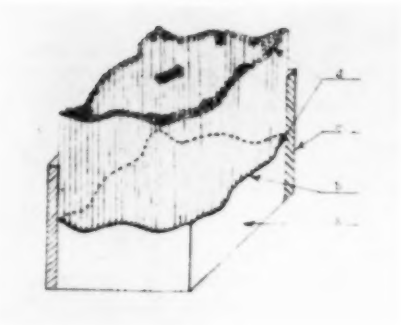
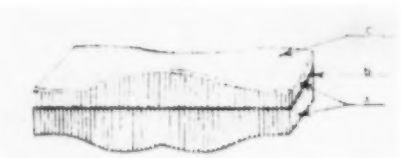


Figure 2



tapped by hand or by vibrating the mold so that the squarely cut ends come into intimate contact with the mold and remain so. As will be readily apparent as the mold becomes filled with tubes, it will be necessary to use bundles containing fewer and fewer elements until the space is reduced to a condition where only individual elements can be inserted. After the mold has been completely filled in this manner, the top and bottom ends of the elements will be at varying elevations depending upon the contour of the mold or die surface upon which the tubes rest, as shown in (d) Figure 1. In this instance, since the tubes were all cut to the same length, one of the contoured core surfaces will be the mirror image of the other.

A suitable binder is then applied by any one of several methods (spraying, dipping, etc.) depending on the number of core assemblies to be manufactured, size of part, type of binder (catalyzed or uncatalyzed), and so on.

The binder may be applied either while the assembly of packed tubes remain in contact against the die surface or the assembly containing the packed tubes held in place by the restraining sides of the mold may be removed intact as a unit and then immersed in a reservoir containing the binder.

After the excess of the binder has been allowed to drain back into the reservoir, the impregnated assembly may be either:

(1) Placed in an oven (if heat is required) with the tubular elements in a vertical position, to insure maximum drainage, and cured in the manner suitable for binder used or,

(2) Placed in intimate contact on the original mold or plaster facsimile, and cured in the manner suitable for the binder used. In this manner, the excess resin in draining against the contoured die surface, ultimately cures to produce a continuous thin resin layer at the die core interface.

If it should be more desirable, the individual bundles of tubular elements can be impregnated, allowed to drain, and even partially cured in some cases **before** assemblying in the mold as previously described and then given a final cure.

Two types of resinous binders have been evaluated in this work; namely a liquid polyester type (Laminac #4116, American Cyanamid Co.) and a liquid spirit soluble phenolic resin (Plyophen 5013, Reichhold Chemical Co.)

At the completion of the prescribed cure cycle, the restraining sides of the mold are removed or disassembled

(Continued on Page 22)

TABLE A
PROPERTIES OF FLAT PANEL SANDWICH CONSTRUCTION MADE WITH VARIOUS CORE MATERIALS

Test	Method	Result* A	B	C
Flexural Strength (Flatwise)	ARTC Spec. Method 110	25,968 PSI	20,304 PSI	20,531 PSI
Stiffness Factor	ARTC Spec. Method 110	7,892 PSI	5,396 PSI	12,080 PSI
Shear Strength	ARTC Spec. Method 140	15,474 PSI	10,563 PSI	26,920 PSI
Bonding (Peel Strength)	Navy Report AML-NAM 252170	10.2# in. of width	4.4# in. of width	15.5# in. of width

*Average of five (5) specimens tested.

Panel A **Core:** ¼" cell glass fabric expanded type honeycomb, Company A, frayed edges with two dips of Plaskon 911-11 resin-acetone solution. Nested core. Average thickness as received 0.391", molded thickness 0.371".

Skin: 4 ply ECC 181-14 each face with 45% resin content (Plaskon 911-11).

Panel B **Core:** Molded, waffle patterned, polyester impregnated glass mat (Selectron 5003). Company B. Average thickness as received 0.315", molded thickness 0.295".

Skin: Same as Panel A.

Panel C **Core:** ¼" cell "Kontour-Kore" paper honeycomb. Core impregnated with Selectron 5003. Average core thickness 0.437".

Skin: Same as Panel A.

The Story of the

John Wesley Hyatt Award

One of the yardsticks for measuring progress in the field of plastics during the past decade has been the annual presentation of the John Wesley Hyatt Award, for distinguished achievement in plastics.

The award is named after John Wesley Hyatt, the "father of the plastics industry." His experiments with cellulose nitrate and camphor in 1867 resulted in the first thermoplastic, celluloid.

Within the next few months a committee, composed of leaders in arts and industry, will meet to select the 1951 award winner. That individual will be given the gold medal and one thousand dollars which comprise the award.

The John Wesley Hyatt Award was conceived as a means of honoring each year an individual chosen by the award committee for his outstanding achievement in the plastics industry in the year for which the award is made.

Any individual, regardless of the nature of his work, who is making an important contribution to the plastics industry, is eligible for the award. The award is presented to the individual, or to an individual representing a research group, responsible for the achievement. It may be given for a series of contributions to the industry representing work done over a period of years. Such a person might be on the staff of an institution of learning or engaged as a consultant.

In selecting the winner, the committee determines the practicability of the achievement proposed for the award, its effect upon the plastics industry, its future value, and the originality of the work. The award may go to a designer, molder, laboratory worker, executive, or any other individual who complies with the standards established by the award committee, regardless of the volume of his work.

The first John Wesley Hyatt Award was given in the spring of 1942, for outstanding achievement in the year 1941. A distinguished committee of judges, forerunner of many notable committees to come, met to select the first medalist. They were: Richard F. Bach, dean of education and extension, Metropolitan Museum of Art; Dr. Lyman J. Briggs, Chief, United States Bureau of Standards; Dr. Karl Taylor Compton, president, Massachusetts Institute of Technology; Watson Davis, director, Science Service; Eric Hodgins, general manager, Time Magazine; Dr. Harry N. Holmes, president, American Chemical Society; and Ronald Kinnear, president, Society of the Plastics Industry. L. T. Barnette served as committee secretary.

The plastics industry at the time had quite completely gone to war. For years prior to the outbreak of World War II, plastics manufacturers had been claiming that their products deserved the careful attention of molders and fabricators who were using metals and wood. The molders and fabricators were skeptical. Then came the war with its shortages, and plastics were given a chance to prove themselves. They did.

One of the valuable roles plastics filled in the year 1941 was given national recognition through the first

Dr. D. S. Frederick
First Hyatt Award

Dr. John J. Grebe
1946 Award

John Wesley Hyatt Award. The award went to Dr. Donald S. Frederick, plastics division, Rohm and Haas Company, who adapted large sections of transparent, colorless plastic to bombers and other military aircraft. The big, clear "blisters" allowed the pilots, bombardiers, and navigators to see far more sky, not to mention enemy planes and ground objectives, than they had ever seen before.

Dr. Per Frolich (left) presents the 1942 award to Frank H. Shaw

Wartime uses continued to dominate plastics in 1942. And again, a wartime application was honored by the John Wesley Hyatt Award. The 1942 winner was Frank H. Shaw, president of Shaw Insulator Company. Mr. Shaw had developed transfer molding of thermosetting plastics, a process which made possible the molding of

very complicated parts. An outstanding wartime use was the manufacture of hand-set telephones used in military communications. These were the "walky-talky" phones found so effective in directing the fire of artillery.

Associated Press Photo
Dr. Stuart D. Douglas received 1943 award.
Dr. Carl S. Marvel at right.

Dr. Stewart D. Douglas, assistant research director in charge of plastics, Carbide and Carbon Chemicals Corporation, received the award for 1943, for his research in the polymerization of vinyl plastics. These were used during the war in the manufacture of electrical insulation, shoe soles and uppers, flexible tubing, and in other places where rubber had been used.

George Scribner (left) presents 1944 award to William Iler Beach.

The last of the strictly wartime awards went to William Iler Beach, for 1944. Mr. Beach, chief plastics engineer of North American Aviation, Inc., was cited for his research and development of the postforming of phenolic laminates, including plastic-laminated cloth used in airplane construction. His research made it possible to substitute fully-cured and dimensionally stable laminated sheet material for metal airplane parts. The plastic materials were lighter, took less time to make, and

Dr. E. R. Weidlein (left) presenting 1945 awards to
Virgil E. Meharg and Paul D. Zottu.

in some instances were more efficient than the metal parts formerly used.

Two men who had worked simultaneously but separately on the electronic heating of thermosetting plastic materials received the John Wesley Hyatt Award for 1945. They were Virgil E. Meharg, superintendent of development, Bakelite Corporation, and Paul D. Zottu, consulting electronic engineer of Newton, Mass. Their accomplishments made possible shorter molding cycles for thermosetting materials, and more uniform textures. The electronic heating process was used during the war to speed production of military telephones, airplane parts and other molded products, and of complicated plywood units including small boats. In citing it as award winner, the committee declared its peacetime significance lay in the speed and uniformity of heating made possible by electronic action. They pointed out that lighter and less

Underwood & Underwood, Washington, D. C. Photo
President Truman awarding 1947 medal to John D. Cochran, Jr.

expensive molds could be used with material pre-heated electronically, since the softened plastic would exert less pressure against the mold.

The award for 1946 went to Dr. John J. Grebe, director of Dow Chemical Company's physical research laboratory, for his work in the production of pure styrene and its polymerization. Robert R. Dreisbach of the Dow physical research laboratory received a silver medal from the award committee for his work with styrene and styrene derivatives. The efforts of Dr. Grebe and his associates in the laboratory made possible the production of styrene pure enough for synthetic (GRS) rubber and other plastics.

John D. Cochrane, Jr., director of research and development of The Formica Company, received the award for 1947, for development of decorative laminates from synthetic and natural resins. His work on laminates included inlaid designs, wood surfaces, solid colors and panels. As a result of his efforts, laminates became a highly valuable tool for the architect, and for furniture and household equipment manufacturers.

A unique feature of the 1947 John Wesley Hyatt award was the manner in which it was presented. The presentation ceremony was held at the White House, with President Harry S. Truman making the award to Mr. Cochrane. Other award ceremonies have been held in New York, Chicago, Detroit, and White Sulphur Springs, W. Va. Often it is held in conjunction with annual meetings of the Society of the Plastics Industry.

1948 award being presented to Dr. George T. Felbeck (left) by Dr. Gerald Wendt

For 1948, the award went to Dr. George T. Felbeck, vice president, Carbide and Carbon Chemicals Corporation, for the engineering developments leading to the large-scale manufacture of polyethylene resins and plastics. Through his work, the United States Navy was able to obtain the large quantities of polyethylene needed during World War II for its radar equipment. Following the war, polyethylene became a major raw material for electrical utilities, packaging, and household accessories.

Vinyl plastics came to the fore again in 1949. The award for that year went to George M. Powell, III, technical head, Vinyl Coatings Research, Union Carbide and Carbon Corporation. Mr. Powell received the award for planning and directing the development, formulation, and application of Vinylite dispersion resins. He was responsible primarily for the development of a method which makes possible the use of high polymers in high solids dispersions in combination with inexpensive thinners. Because of his work, the toughest and least soluble of vinyl resins now can be used economically to coat cloth, paper, foil, metal, as well as in inks, dip goods, elastomeric molded articles, and unsupported films.

George M. Powell, III, (left) receives 1947 award. John W. Snyder congratulates him. Charles A. Higgins, President of Hercules Powder Co., looks on.

The award winner for 1950 was James Bailey, vice president and director of research, Plax Corporation. He received the award for his research in techniques and invention of machines for the successful extrusion of thermoplastics. These included techniques for the production of plastic bottles; sheet and film for packaging; and extruded plastic rod used for tool handles and similar applications.

Mr. Bailey had started on a commercially practical process for blowing plastic bottles in 1937. By 1950, the unbreakable plastic bottle had become a major commercial product of the plastics industry.

Chase-Greenbrier Photo

James Bailey, 1950 award winner showing medal to Mrs. Bailey.

Looking back over these awards, it is apparent that each marked the rise of a new material or a new technique which subsequently became a dominating influence in its field. Materials and methods singled out for honor by the Hyatt Award committees represent, without exception, many of the important changes that have taken

place in United States plastics production over the past decade.

The seeming prescience of the John Wesley Hyatt Award must be credited directly to the discriminating foresight of the men who have served as members of the award committee. The presidents of the American Chemical Society and the Society of the Plastics Industry are standing members of the committee. Other distinguished members of the committees have been: Charles F. Kettering, vice president, General Motors Corporation; Dr. O. E. Buckley, president, Bell Telephone Laboratories; Dr. Edward R. Weidlein, director, Mellon Institute of Industrial Research; Dr. Gerald Wendt, editorial director, "Science Illustrated"; Waldemar Kaempffert, science editor, New York Times; and George Braxton Pegram, vice president emeritus, Columbia University.

William T. Cruse, executive vice president of the Society of the Plastics Industry, has served as secretary of the John Wesley Hyatt Award committee since the 1943 award. His address is: Society of the Plastics Industry, 67 W. 44th Street, New York, N. Y.

Leaders in many fields have made presentation addresses at the award ceremonies. The first address was given by Ralph Hyatt, son of John Wesley Hyatt. His topic was: "I Remember." Other speakers and their topics have been: 1942, Harvey Wiley Corbett, architect, "Looking Ahead;" 1943, Bradley Dewey, rubber director, War Production Board, "The Synthetic Rubber Program;" 1944, J. A. Krug, director, War Production Board, "The Plastics Industry and Reconversion;" 1945, Dr. Edward R. Weidlein, director, Mellon Institute of Industrial Research, "Plastics Progress Through Research;" 1946, Walter Dorwin Teague, industrial designer, "Design—And the World Today;" 1947, The Honorable Harry S. Truman, President of the United States, "You Have Done Well;" 1948, James L. Palmer, president Marshall Field and Company, "Guideposts to Merchandising;" 1949; The Honorable John W. Snyder, Secretary of the Treasury, "The Future of American Industry;" and 1950, Arthur H. Motley, president, Parade Publications, "Use It or Lose It."

The John Wesley Hyatt Award is sponsored by Hercules Powder Company. Administration of the award is exclusively in the hands of the award committee.

Athens, Ohio., August 3, 1951

Society of Plastics Engineers, Inc.,

Athens, Ohio.

We have examined the books of The Society of Plastics Engineers, Inc., for the period July 1, 1950 through June 30, 1951 and found them maintained in accordance with accepted accounting principles.

While we did not make a detailed audit of the books, we did make sufficient tests and reconciliations to satisfy ourselves that the statements attached reflect the financial condition of this Society as of June 30, 1951.

R. E. Stephenson

SOCIETY OF PLASTICS ENGINEERS, INC.

FINANCIAL STATEMENT AS OF JUNE 30, 1951

ASSETS

Cash in bank			$10,065.54
Petty cash fund			10.71
Accounts receivable—			
Sections		40.00	
Advertisers		558.12	
		598.12	
Less bad debt reserve		300.00	298.12
Furniture & fixtures		1,701.67	
Less accrued Dep.		650.58	1,051.09
Post office deposits—			
Second class permits		38.70	
Postal meter		89.12	127.82
Prepaid expenses			246.44
Advance to 1952 conference			225.62
TOTAL ASSETS			$12,025.31

LESS LIABILITIES

Accounts payable—			
Sections	$ 447.50		
Miscellaneous	1,027.54	1,505.04	
Deferred income		6,611.50	8,116.54
NET ASSETS			3,908.80
NET ASSETS WERE OBTAINED FROM—			
Surplus June 30, 1950		175.87	
Gain for period ending June 30, 1951		3,732.93	
TOTAL			$ 3,908.80

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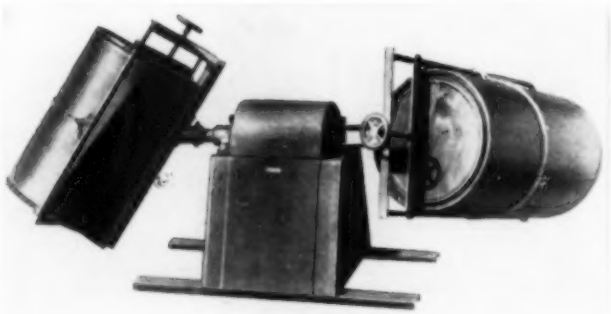

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Successful Designing For Plastics Molding

By W. M. HALLIDAY

The advantages and reasons for using plastics materials are recounted in this article.

As a preliminary to the development of any sound and successful component design it is essential that the most appropriate material and method of molding or fabricating such material be selected.

Still further to assist towards that same objective, it will doubtless be found of considerable assistance if a short account is now given of some of the chief reasons which incline designers to adopt plastics molded parts in preference to those made of wood, metal or any of the other more conventional constructional materials.

Ease of Shape Formation

Most plastics materials may be very easily and economically converted into practically any shape because of the great variety of forming processes and methods available. Most materials are, in fact, molded either by the compression, injection, transfer or extrusion methods.

With these latter methods of production practically any configuration of a component is possible, consistent, of course, with the reproduction of that shape in reverse form in the mold or forming tool. This indeed is a most important feature which should constantly be borne in mind by the designer.

Shapes for molded components especially may be of a very intricate character. The limitations in this direction being the ability of the skilled tool-maker to reproduce such a shape in the mold with accuracy and economy, or the ability of the molder to operate the tool effectively, or both of these considerations.

By the introduction of cores (of one kind or another), holes, recesses, undercuts, complicated contour, and similar difficult shapes may be readily formed on a molded component. Such coring provisions built into a plastics mold may be fixed or movable as circumstances demand. Cores of the movable kind can be arranged in a variety of ways so as to slide laterally through the mold block, to rotate therein, or to screw into threaded holes provided in the mold, and so forth. Such recesses may be formed on the exterior or interior of the part.

Furthermore, the designer has to remember that it is comparatively easy to fashion threaded portions on a molded component with accuracy, and often without adding to the operating cycle time for the mold. Internally threaded holes, or externally threaded projections, can be produced with equal facility within specific size ranges.

In cases where a metallic screw has to be repeatedly inserted into the finished molding, in order to overcome the liability to wear on the threads of the molded plastic article, the designer may introduce what are known as metallic "inserts." These are extensively used in the case where a component has a number of small diameter threaded holes having to withstand such wear effects or when the diameter of the hole is too small for safe molding. A small metallic brass or aluminium bushing having a threaded hole is admitted to the mold, and is thus molded in its correct position in the component. Very secure anchorage may be obtained for such insertions, because the natural contraction of the plastic material attendant upon cooling is utilized for binding the metallic insert in place.

Uniformity and Dimensional Stability

In many instances where the shape of a component is judiciously blended or adapted expressly to suit the requirements of the molding process, costly subsequent difficult machining or assembly operations may be completely eliminated, or appreciably simplified in some manner. Alternatively, it often happens that such a blending of component shape and design forms, the better to suit mold construction or operation, will permit the component to be made as a single molded piece, thereby removing the necessity to make it from several smaller separate units, which may be entailed if any other manufacturing method and materials had to be selected.

In these, and many other similar ways, considerable economies may be obtained by the far-seeing designer. Such economies may often prove of such a magnitude as to render plastics molded articles the most economical kind of components to employ.

Another very important reason which often appeals to the engineer-designer when having to decide whether or not to use plastics moldings, is the high degree of dimensional accuracy and shape uniformity achieved by the molded processes. By the compression and injection-molding processes especially very close control can be obtained over dimensional variations.

This is a particularly valuable feature, especially when large quantities of components are envisaged, each of which has to be produced to a high standard of size of shape duplication. It will also prove invaluable when precision-type molded components are required, embracing a number of dimensions upon which close limits of error are fixed.

Mold-making practice and technique are constantly being improved by the development of new mold steels, or by the introduction of new methods of mold manufacture to enable difficult constructions, especially in respect of cavity formations, to be more easily obtained.

Knowledge of such mold manufacturing developments will often prove of inestimable value to the engineer-designer when embarking upon the evolution of a plastics-molded component design, because mold design is very closely related to manufacturing as well as component design.

To some extent control over dimensional and shape variations in a plastics molding will be dependent upon the type of material employed. Some materials have a greater degree of inherent shrinkage than others, and so will contract a greater amount upon leaving the mold. Secondly, the quality and accuracy of the mold construction itself will also influence the uniformity and accuracy of the finished parts. Thirdly, the operating technique employed during the molding operation may also introduce factors, which, in turn, will produce variations in the shape or size of components in a batch.

New plastics materials possessing greater stability and permitting more rigid control over shrinkage or warping attendant upon moldings, are almost daily being evolved. Knowledge of such new processes and plastics materials will prove of tremendous interest and utility to the designer, who thereby will find many of his problems appreciably elucidated.

Economical Production

In cases where the total quantity of molded components is very large, molding may be found a very inexpensive and economical matter. Care has to be exercised by the designer when assessing this point, however, since total batch quantity ordered or required is not always the sole deciding factor.

The number of moldings required must be sufficient to warrant the necessary initial outlay on molding tools, and all the other mechanical accessories attendant upon efficient manufacture and inspection of the parts produced.

In nearly every instance the de-

signer will have to reach a balance between quantity and tool costs. Often the shape of the component itself, rather than the quantity will determine whether to employ moulings or not. Thus, in the case of a very intricately shaped article, of which only limited quantities are required, upon examination of all the factors and other costs associated with different methods of manufacture, it may be found that molding is really the most economical proposition notwithstanding the relatively high mold charges involved when spread over the small quantity of parts.

Another important aspect of this same problem relates to the case where, by having a plastic-molded component, several succeeding operations are eliminated or appreciably simplified. The total savings effected by the adoption of a plastics-molded article may then be found to offset far greater the costs of the molding tools.

Yet again, in the case of very large batch quantities of parts, the designer has to remember that it may be possible to employ multiple impression molds, with identical cavity formations, or multiple impression combination molds having sets of cavities, with each set of different shape. By means of molds of this character, complete sets of moldings comprising several unit parts may have been produced at each shot or cycle of the molding machine. Whilst such elaborated molding tools will cost much more than single impression tools, far greater production rates and outputs will be obtainable, and, therefore, there will be a considerable reduction in overall production costs.

Production and mold manufacturing costs of this and a related kind often forms one of the chief considerations confronting the designer. This is one of the chief reasons why it is essential that he be well familiar with the various molding processes and their requirements, so that a component shape and design may be fashioned as closely as possible in conformity with them.

Equipped with such knowledge the designer will also be guarded more effectively against stipulating difficult shapes or dimensional tolerances, which if persisted in, through to the production stages, may involve a great slowing down of the molding procedure and the rate of output. For the same reason, too, worth-while savings may be obtained in the actual mold costs if the simplest component shapes are selected consistent with efficient machining of the mold and satisfaction of service requirements.

Strength and Weight

Very many of the plastics materials are extremely light in weight, yet at the same time possess considerable tensile and compressive strength. This feature is often utilized to great advantage by the designer because it enables him to have a component of relatively thin wall section but of due strength for his purpose. The process of molding, either by the compression or injection method, also readily permits ribs, bosses, beadings, fillets and similar strengthening formations to be incorporated in the component, and at the same time easily included in the mold construction.

Thus, from this angle, the designer will know that he can often effect considerable economies in material without sacrificing any of the mechanical strength of the finished article.

Considerable care has to be exercised when introducing such strengthening features to ensure that they are located in such a way as will enable the mold to be constructed in the simplest manner, and to allow the finished molded article to be readily withdrawn from the mold.

For many applications these two factors of weight and strength alone conspire to make the use of plastics highly desirable, and indeed in some cases vitally necessary. Good examples of such applications are plastics components of various kinds to be used for the internal fittings of aircraft.

Heat and Electrical Insulation Qualities

Nearly every type of plastics material possesses excellent insulating qualities against heat and the passage of electrical current. Furthermore, not only can they be used purely as insulators in either application, but they can be also employed as structural members on account of their strength and stability. This, indeed, is often a most useful dual feature, which can be turned to great advantage by the designer when one bears in mind that many of the more conventional insulating materials, such as asbestos, mica, and porcelain, have very low mechanical strength, and thus usually can only be safely used for the single purpose of insulating.

Simplified Designs of Component

Another valuable feature which will often strongly appeal to and interest the engineer-designer when contemplating the use of plastics moldings, is that the process of molding will often enable very considerable simplification to be made to the shape, sizes, contours or relationship of the molded part to other components in similar materials, or in metals or wood.

Many plastics molded components, particularly those for industrial applications, have to be specifically designed for use, or operation in conjunction with other components, or as members of an assembly comprising articles in wood and metals as well as plastics materials.

Where a component in metals has to be substituted for one in plastics, considerable economies may be derived if the shape can be modified in some manner the better to suit subsequent assembly or machining functioning. If such a metallic component has to be built-up from a number of small units to fashion the requisite shape, the simplifications afforded by using a plastics molded article will often be important to the designer and user.

Surface Finish and Color

Practically every plastic material is capable of being reproduced, either by molding or fabricating from sheetings, with excellent surface finish. This, again, constitutes a very valuable feature for the designer, chiefly in those cases where the molded component has to be distinguished by high-quality surface smoothness or pleasing appearance.

Many materials have valuable transparent or translucent properties. This renders their use especially advantageous in certain obvious applications as a superior substitute for glass. Indeed, innumerable optical applications are now being satisfactorily fulfilled by the transparent group of plastics materials.

The range of color possibilities with plastics materials is almost unlimited, and certainly unexcelled. Not all colors are available in every material, of course, notably such a limitation is present in respect of the phenolics, which generally are in the darker shades.

The designer will appreciate also that very great possibilities are open to him in regard to color blending. Not only can plastics be obtained in a great variety of natural colors, but surface finishes to give color combinations or contrasting effects can easily be applied after molding has occurred.

In determining this aspect of component design, however, it is essential to bear in mind that a color or shape which gives an attractive appearance in, say, a metallic component, will not necessarily produce a pleasing appearance in a plastic molding. This will be particularly the case with the dark brown or black phenolic plastics materials used for industrial applications, because a plain, unrelieved or undecorated black piece will have poor inherent surface interest.

Attractive contrasting colored effects may be obtained quite readily with many plastics materials. This may be achieved either by the external application of paints, enamels, lacquers or plating deposits after the component leaves the mold. On the other hand, the article may be actually molded in sectional form, each in a different color, and then assembled simply to complete the component.

Plastics materials can also be very

tastefully combined with polished, electroplated or lacquered metallic surfaces, to obtain other desirable and attractive color contrasts. This, indeed, is a field of development which has only just been opened up. Its full development certainly will afford great scope for the designer fully alive to the importance of the aesthetic values and who requires molded articles of superior or unusual surface finish.

From the angle of the development of a whole set of new color combinations for use with or to replace those components which, in the orthodox and uninspired colors or color combinations, now given them, undoubtedly cause eye strain, fatigue, and repel interest, the plastic designer has tremendous opportunities.

Yet another very useful feature associated with most plastics which will often appeal to the designer of parts intended to fulfill a purely utilitarian function is that of the pleasant "feel" possessed by these materials. Such a feature will be most appropriately associated with components which have to be handled constantly, e.g., small hand-tools, handicraft appliances, domestic ware, etc. The satisfaction of the sense of touch is an angle often completely ignored by the engineer-designer, as is evidenced by the continued appearance of handles, knobs, gripping devices of various kinds which often are of such a shape, and material, as to be most repellent to pleasurable retention, and inconducive to minimum strain attendant upon constant handling.

Far too often articles of this kind, of which a file handle is a very good example, are made of such a shape that the hand cannot obtain a natural grip thereon. These result in strain on the fingers or the wrist of the user, thereby leading to earlier fatigue or a drop in efficiency of operation. The amount of strain and loss of nervous-energy attributable to such a simple cause may not be computable, but anyone who has to use a wrongly shaped handle on a tool, or one made from an unsuitable material for a lengthy period, will understand the nature of such a loss.

This, again, is a field in which the plastics molding designer can play an important role because of the availability of a number of materials having a pleasurable "feel" to the sense of touch.

This completes the brief general survey of some of the chief reasons leading to the use of plastics materials. Those given, however, by no means exhaust all the advantageous and interesting features possessed.

In the next section consideration will be given to the various essential requirements of component design.

(To Be Continued)

This is the third in a series of articles by Mr. Halliday, reprinted by permission of the English magazine "Plastics."

QUEBEC TALK ON MOLD FINISHING

By E. PETER HERSEY

The November meeting of the Quebec Section took the form of a round table discussion on the topic of "Mold Polishing and Finishing." The discussion was moderated by Jack Thomas of Dow Chemical Co. and questions were directed at a panel of experts that included F. Kirchner of Hale Bros., J. Rundle of Buttons and Ornaments Ltd., and A. Mitchell of Union Screen Plate Co.

Twenty-five members and guests attended the meeting. The programme committee was very gratified by the enthusiasm and interest with which the members and guests asked and answered questions. Following the two and one-half hour discussion, the members expressed the opinion that another discussion evening should be held before the end of the 1951-52 series of technical meetings.

NEWARK OFFICERS ELECTED FOR 1952

By ANTHONY NATURALE

The Newark Section of the Society of Plastics Engineers closed its year with their annual Christmas Party held at the Military Park Hotel on December 12, 1951 in Newark, N. J. Although this meeting started out the same as meetings and parties previously held by the SPE, the similarity ended after our president Mr. Peter Simmons, Dow Chemical Co., opened the meeting and introduced the officers and directors elected to serve the society for 1952.

The following officers were elected: President, E. W. Rowan, Dillon & Beck, Hillside, N. J.; Vice President, J. Bonanno, Lionel Corp., Irvington, N. J.; Secretary-Treasurer, J. Pectal, Tennessee Eastman Corp., Tenn.

In addition to the above officers the following directors were elected:

National Director, I. Thomas, Thomas Mfg. Corp., Newark, N. J.; Section Directors, A. Naturale, Naturale Tools, Inc., Newark, N. J.; E. K. Preston, Koppers, Inc.; W. W. Gryce, Newark Die Co., Newark, N. J.

After dinner the dining room was transformed into a gambling casino and the members and guests speculated with $650,000 of play money. After all the money changed hands several times, the gambling tables were removed and an auction was held in the dining room with prizes (which had been donated by the various companies in the Newark area) going for as high as $50,000 play money.

New members announced at this meeting included:

J. Etkin, Industrial Synthetics, Garwood, N. J.; P. H. Schaef, Pyro Plastics, Union, N. J.

Our next meeting was held at the Military Park Hotel on January 9, 1952 and the New York Section was invited to be our guests at this meeting.

The speakers for the January meeting were as follows: Mr. John P. Charlton, Manager, Plastics Division, Ciba Co. Inc., New York, N. Y., who spoke on "The Uses and Characteristics of Epoxy Resins" and Mr. J. T. Leyden, Service Engineer, Crucible Steel Co. of America, Syracuse, N. Y., who spoke on "The Use of Prehardened Steels for Injection Molds."

OLYMPIC PLASTICS PROMOTIONS

Arthur Morris, president of Olympic Plastics Company and Olympic Reinforced Plastics Corporation, Los Angeles, California, announces the appointment of Paul Theodore to the sales and product development department.

Mr. Theodore was previously employed as southern manager for Fortnight, California's own newsmagazine. He was in charge of sales and merchandising, and brings to Olympic a successful background in these fields.

He will work under the direction of D. C. Siteman, Olympic Plastics Company general manager, assisting him in the contact and servicing of contract customers. The promotion of Olympic's proprietary items will be handled by Mr. Theodore and he soon will announce the appointment of sales agents nationally.

Olympic Plastics are molders in injection, compression, and transfer molding, they operate their own design and die making facilities.

Olympic Reinforced Plastics Corporation fabricate and mold in fiberglas materials and are producing honeycomb panel assemblies, rods, tubing, ducts, angle, radar domes and glass and fabric molding. Both plants operate on a 24 hour per day basis.

BARRIER-PRIBBLE FIRM EXPANDS

Barrier-Pribble and Company have announced their moving to new and enlarged quarters at 554 Eben Street, New Haven, Indiana. New Haven is located on U. S. highways 24 and 30, about 5 miles east of Fort Wayne. Their engineering and design offices have been enlarged and a new printing machine installed to improve service, particularly on designs for large parts. Space for development programs and limited production on castings, polyester laminates and molded thermosets has been increased to 2000 square feet. Pressing facilities to 75 tons are available. Their mailing address remains P. O. Box 55, Fort Wayne, Indiana. The new telephone number is 5273, New Haven, Indiana.

TORONTO HEARS EBERS ON KRALASTIC

New Directors Are Announced

By JOHN KEMPF

Forty-seven members and guests attended the last dinner meeting of the year in the St. Regis Hotel. After the dinner, President Jack Kempf greeted the guests from Canadian Naugatuck Chemicals, Allen Clark, Jim Fuller, Bob Strong and Mel Metcalfe. The speaker was Dr. Earle Ebers of Naugatuck Chemical, and his subject was "Kralastic and Celogen."

The properties and applications of the styrenated polyester Kralastic were demonstrated by the wide variety of sample moldings which Dr. Ebers brought with him. The various requirements of an ideal thermoplastic appeared to be fulfilled by this material in that it had all the advantages of styrene without the latter's brittleness. As yet the plastic was not available in other than the darker colors. After answering numerous questions regarding Kralastic, Dr. Ebers then spoke on Celogen. A good foaming agent should be nontoxic, odorless and colorless. Early agents such as nitrogen, carbon dioxide and certain organics fell down on one or more of these points as well as giving difficulties arising out of the diffusion of the gas and changing internal pressure. Research led to the development of Celogen, now widely used as a foaming agent for vinyls, both rigid and elastic. Methods of use were detailed. The vinyl polymer, plasticiser and Celogen are milled together. The material is then subjected to an initial heating in a tightly-closed mold. Subsequently the molded piece is given an additional heating which softens it and it expands until the internal gas pressure reaches atmospheric. This can result in a ten-fold increase in volume. Densities as low as 6 to 8 lb. cu. ft. were obtainable, with a Celogen content of about 20%.

The president thanked Dr. Ebers and announced that four new directors were elected, I. Duviner, T. Carey and J. Burnie for a three-year term and G. Hale for a two-year term. At the election of officers, Mal Wilkinson became president for '52, with Tom Carey as vice-president, Jack Burnie as secretary and I. Duviner as treasurer.

Core Material

(Continued from Page 14)

and the rigid core structure removed from the die surface. In this case, the core is now ready for use in sandwich panel construction. In the case where different contoured surfaces occur opposite one another or in the same assembly (see Figure 2), it will be necessary to cut a flat surface on one or more planes as illustrated and to secondarily bond two or more master sections of contour core together to produce the ultimate core configuration.

Table A gives a comparison of typical physical strength data obtained for flat sandwich panels fabricated from a paper base core manufactured by the Kontour-Kore process vs. an expanded glass cloth base honeycomb type core and a molded glass mat type core.

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(4) Development of a Sandwich Type Cargo Floor for Transport Aircraft. Report #1550C ibid.

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(6) Results of Some Tests on Low Density Materials. Buckling loads of Flat Sandwich Panels in Compression. Report #1509 ibid.

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(8) Methods of Test for Determining Strength Properties of Core Material for Sandwich Construction at Normal Temperatures. Report # 1555 ibid.

(9) Methods for Conducting Mechanical Tests of Sandwich Construction at Normal Temperatures. Report #1556 ibid.

(10) Cellular Cellulose Acetate Core Material in Shear. Report #1559 ibid.

(11) Aluminum Face and Paper Honeycomb Core Sandwich Material Tested in Shear. Report #1559A ibid.

(12) Fiberglas-Honeycomb Core Material with Fiberglas-Laminate or Aluminum Facings. Tested in Shear. Report #1559-C ibid.

(13) Fiberglas-Laminate Face and End-Grain Balsa Core Sandwich Material. Tested in Shear. Report #1559-D ibid.

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(15) Cellular Cellulose Acetate Core Material with Aluminum or Fiberglas Facings, Tested in Shear. Report #1559-F ibid.

(16) Fiberglas-Laminate Facings and Paper Honeycomb Core Sandwich Material Tested in Shear. Report #1559-G ibid.

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(32) Buckling of Long, Thin, Plywood Cylinders in Axial Compression. Report #1322. Forest Products Laboratory, Madison, Wisconsin.

(33) Thin-walled Plywood Cylinders in Bending and Torsion. Report #1501 ibid.

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Section Notes

Baltimore-Washington

Baltimore-Washington met January 8th at the Park Plaza Hotel in Baltimore for a symposium on "New Developments in Vinyl Processing." Speakers were: Louis F. Street on "Multiple Screw Extruding," Chester J. Scanlon on "Dry Blend Compounding," and E. J. Wohlfarth on "High Frequency Processing."

Philadelphia

"Plastics in the Rehabilitation Program" was the subject of a talk by Miss Dorothea Jarlor of Rohm and Haas at the December 17th meeting of the Philadelphia section, which met jointly with SPI.

Rhode Island

Rhode Island and Southeastern Massachusetts viewed a movie "Colorado Diary" at its December meeting. This ladies night meeting was impressed by the superb color photography of the spectacular panoramas of the western United States, taken by Lester Shaal of the Providence Camera Club.

Rochester

"Methods of Gating for Transfer and Plunger Molding" was presented before the Rochester section at their December meeting, by Ed Borro of Durez. Mr. Borro has spent much time and effort in arriving at definite answers to the question, "Does restricted gating work for thermosetting materials?"

Upper Midwest

The Upper Midwest section heard M. A. Nicholls of Manco Products speak on "Why Beryllium Copper Molds?" Added features were two excellent movies "Hunting in Alaska" and "Business Galore."

SOUTH TEXAS ELECTS OFFICERS

The Board of Directors, South Texas Chapter, Society of Plastics Engineers, met on Monday, Dec. 10 and, in keeping with the By-Laws of our organization, elected officers for the coming year.

These are your new officers; elected from the Board of Directors:

President, Carl J. Eckenrod, Chief Engr., Wright Mfg. Co.; Vice Pres., A. F. Fukal, Industrial Designer; Sec.-Treas., Chas. E. Shepherd, Pres., Industrial Plastics Mfg. Co.

PREXY BARON PRESENTED WITH WATCH

Prize paper winner; new officers announced

By ARTHUR M. MERRILL

The New York Section concluded the year with its third annual Christmas Party, held on December 19 at the Gotham Hotel. Some 70 members and guests took part in the highly successful party which included a cocktail hour, dinner, gala floor show, and distribution of table favors and numerous door prizes. Much of the credit for the party's success is due to the efforts of Saul Blitz, Noma Electric Co., who was in charge of arrangements for the entertainment program.

In a brief business session following the show, a certificate for first prize in the local prize paper contest was presented to Louis C. Barail, United States Testing Co., for his paper on "The Biology of Plastics."

Retiring president George Baron, Ideal Plastics Corp., announced the new slate of officers for 1952, as follows: president, Bruno E. Wessinger, Wess Plastic Molds, Inc.; vice president, Arthur M. Merrill, "India Rubber World;" secretary-treasurer, Arthur L. GeWertz, manufacturers representative; national director, Stanley Bindman, Jamison Plastics Corp.; and local directors, (one year) Messrs. Baron, GeWertz, and Wessinger, and Sanford S. Zimmerman, F. J. Stokes Machine Co., (two years) Messrs. Blitz and Merrill, and Russell H. Skidmore, Celanese Corp. of America, and (three years) William Lewi, Dusal Tool & Mold Co., Harold H. Schwartz, Empire Brushes, Inc., and J. Martin Voegtles, Celanese Corp.

Mr. Baron spoke briefly, thanking the officers, directors, and members for their cooperation in making 1951 a year of active progress and growth for the Section. Mr. Wessinger also thanked the outgoing officers, and expressed the hope that, with the cooperation of the members, the coming year will see the further growth and success of the group. In a surprise ceremony, Mr. Wessinger presented Mr. Baron with a watch in token of the Section's appreciation of his efforts.

Table favors were distributed through the courtesy of Stott Tool & Machine Co., and the party ended with a drawing for many door prizes contributed by American Molding Powder Co.; Dusal Tool & Mold Co.; Empire Brushes, Inc.; Ideal Plastics Corp.; Monsanto Chemical Co.; H. Muehlstein & Co., Inc.; Riverdale Laboratories; United States Testing Co.; and Wess Plastic Molds, Inc.

On January 9 the New York Section were guests of the Newark Section at a joint dinner meeting at the Military Park Hotel, Newark. Technical speakers were J. T. Leyden, Crucible Steel Co. of America, on the subject, "Use of Pre-Hardening Tool Steel," and John R. Charlton, Ciba Co., Inc., who discussed "Araldite Resins."

CONNECTICUT MEETS DESPITE WEATHER

By DAVID MERSEY

Friday, December 14. That was the day when one could rightly say about the New England climate, 'if you don't like it, wait a minute'. By 5:00 p.m., the roads were covered with a thin layer of ice; by six o'clock, every town was isolated. Charlie D'Emery did some very fancy 'flying' from Norwalk to Bridgeport; however, this is old stuff for him. The best bit of blind flying was done by Jim Orr, who brought in three passengers from Waterbury; eighteen miles in three hours. However, some twenty odd loyal die-hards finally did appear for the meeting.

An announcement was made that three new directors were elected: James Wheeler of Bridgeport; James Orr of Waterbury; and David Mersey of New Haven.

Howard Madsen then showed a film on the manufacture of steel, showing the three types or methods used, i.e., the blast furnace; open hearth; and the electric furnace.

The evening's speaker was Albert Aubin of General Electric Company at Bridgeport, who talked on Quality Control. This subject breaks down into two phases, the experimental and quality. In either case the problem was handled by statistical methods. As aids, Mr. Aubin plotted several curves, and showed how to arrive at averages and standard deviations; also how to determine the upper and lower limits in control charts. Unfortunately there was a small turnout for what turned out to be an excellent program.

N. W. PENN NOTES

By PAUL ROCHE

After a successful year of allocating and sales promoting (in that order), and having warmed up on a program of pre-Christmas cheer in the Northern areas, Al Berry of The Dow Chemical Co., Cleveland office flew off to Florida for the holidays. This is by way of an annual pilgrimage for elligible bachelor Berry, his parents being located permanently in Florida.

Alert molders, if they look quick enough, will see a Ford sedan zipping around Erie bearing the marking of "Erie Die Co." The regular pilot is Chuck Williams, partner of Charlie Asmus in that good company. We molders are always glad to see such evidences of streamlined service facilities, particularly if they can be added without corresponding increase in overhead expense eventually reflected in die costs.

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MIAMI VALLEY SECTION ELECTS OFFICERS AND DIRECTORS FOR 1952

By JOHN L. RUSSELL

Election of three new Directors of the Miami Valley Section, Society of Plastics Engineers, Inc., was announced recently. Those to serve during the years 1952 through 1954 are Joseph Merke, Plastics Molding Corp., Cincinnati; Paul A. MacPhee, National Cash Register Co., Dayton; and Richard Bice, Formica Insulation Co., Cincinnati. All have been active in SPE affairs for a number of years and are expected to contribute heavily toward the maintenance of Miami Valley Section as one of the leading and most progressive units of SPE. The new Directors replace outgoing Directors Martin H. Kasch, Robert Gerdes and John Brierly.

Holdover Directors are B. W. Nelson, National Cash Register Co., Dayton; Charles Selz, Kurz-Kasch, Inc., Dayton; Otto Fiedler, F & F Mold and Die Works, Dayton; Carl E. Weber, Crosley Div., Avco Corp., Cincinnati; Merle Nelson, Plastics Moldings Corp., Cincinnati; and Ralph Backscheider, Recto Molded Products Co., Cincinnati.

The nine members of the new Board of Directors will meet and elect officers for the coming year.

The most successful of the annual Christmas parties was held at the Miami Valley Golf Club on December 7. A large crowd of 120 persons was present and danced to the music of Carl Baer's orchestra. Prizes were offered for games and a radio was given away as a door prize and won by Mrs. Henry Kasch, Jr. A tasty midnight buffet style dinner climaxed the evening. Many thanks to the planning committee headed by Ralph Backscheider and Carroll Jensen. It was the kind of event that the ladies look forward to each year, and provides a pleasant get-acquainted atmosphere for everyone.

Let's get behind our new Officers for 1952 and boost Miami Valley Section even higher. And to our retiring officers—a job well done, Martin H. Kasch, President; Byron Nelson, Vice-President; Carl E. Weber, Secretary; and Charles Selz, Treasurer.

PAUL ELLIOTT DESCRIBES KRALASTIC AND VIBRIN FOR EASTERN NEW ENGLAND

By ROBERT C. DAVENPORT

The SPI met with us on December 6th in another of our enjoyable joint sessions of this season. This meeting was sponsored by the SPE. A brief business meeting was held. Mr. Reed Esterbrook, of Northern Industrial Chemicals, Inc., pleaded for joint letter writing efforts to each individual's congressman to point out the suffocating restrictive effect of regulations now going into effect against the recommendations of the Advisory Committee of the Plastics Industry. He pointed out that controls of the past war were more than adequate and quite workable and suggested that a substitute be made thereof.

The results of the SPE Eastern New England Section's election were published. Mr. John LaBelle was re-elected for another one year term as National Director. The three Sectional Directors elected for three year terms were: Mr. J. T. (Jack) Moore of Tennessee Eastman Company, Mr. Melvin S. Haas (reelected) and your correspondent, both of the Bolta Company.

Mr. William Root of Raytheon Corporation introduced the speaker, Dr. Paul M. Elliott. Dr. Elliott, who has been with the Naugatuck Chemical Division, U. S. Rubber Company for the past several years, has been manager of Kralastic (thermoplastic resin-rubber blends) and Vibrin (thermosetting polyester) development in the past five years. He gave a very interesting talk, illustrated with items in every day use, on 'Rubber-Plastics Compositions.' These articles varied from things as personal as a pocket comb to those as specialized as injection molded fittings for chemically resistant pipe.

Approximately seventy people were present for this meeting. We are scheduled to meet at the Beaconsfield on Thursday, January 31st, at which the SPI chairman will preside. The following meeting will be SPE sponsored on Thursday, February 28th.

The eighth annual convention of the SPE was in Chicago this January. Remember, convention of SPE to be in Boston '53.

Golden Gate Hears Injection Principles

By RICHARD WEBER

The monthly meeting of the Golden Gate section was held at the El Jardin Restaurant, November 29.

Mr. L. E. Tallman of the Dow Chemical Company favored the group with a splendid talk and moving picture. The subject Mr. Tallman spoke on was "Recent research in injection molding principles."

The motion picture, which so captured his audience was titled "Inside the injection mold."

President Joseph Smith presided with thirty eight attending.

The evening was acclaimed by our members as a spirited and highly educational one.

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